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DEVELOPMENT OF A SIMSMART BASED, PROGRESSIVE FLOODING DESIGN TOOL

by

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March 1999

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DEVELOPEMENT OF A SIMSMART BASED, PROGRESSIVE FLOODING DESIGN TOOL

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ABSTRACT

While the Navy addresses the effects of progressive flooding in its design requirements, its limits for damaged stability are the results of World War II damage analysis and are evaluated under static conditions, without regard for shipboard damage control systems. This thesis develops a program which utilizes the SIMSMART flow analysis program in tandem with naval architecture analysis in Microsoft Excel, to simulate progressive flooding of a ship based on the varying specifics of a given scenario. This program can be used to aid designers in dynamic simulation of the flooding process not only to determine the adequacy of dewatering equipment, but also to establish a timeline, including naval architecture parameters, throughout the process.

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I. INTRODUCTION

A. BACKGROUND

The use of watertight bulkheads as a means of minimizing the adverse effects of flooding in ships is not a new concept. As early as the thirteenth century, Marco Polo referred to the use of watertight bulkheads in Chinese junks [Ref. 1]. While their use made sense qualitatively, at the time their actual impact on damaged stability and ship survival could not be quantified. Dynamic damage control, such as dewatering, is an even older practice, which once again was not undertaken as the result of calculation, but rather because it made sense. As vessels became more and more complex this qualitative approach to damage control, both static and dynamic, became increasingly dangerous. The U.S. Navy acknowledged the potential for disaster in the 1930s when it included, for the first time, damaged stability as a major design factor. Standard procedures for damage control were implemented after they proved successful in limiting flooding during World War I. In the wake of World War I, the Navy began conducting damaged stability studies on new combatants. While these studies were limited by today's standards, they did lead to new designs and modifications that enhanced ship survivability during World War II. In 1947, the Bureau of Ships (BuShips), the current day Naval Sea Systems Command (NAVSEA), conducted a study of 10 combatants (ranging from destroyers to an escort carrier) and 14 auxiliaries that had survived torpedo hits during World War II [Ref. 2]. The results of the study (plotted in Figure 1.1) led the

Navy to require that ships be capable of withstanding a shell opening equal to a certain percent of their length. The length of this opening was designated as 15% for combatants

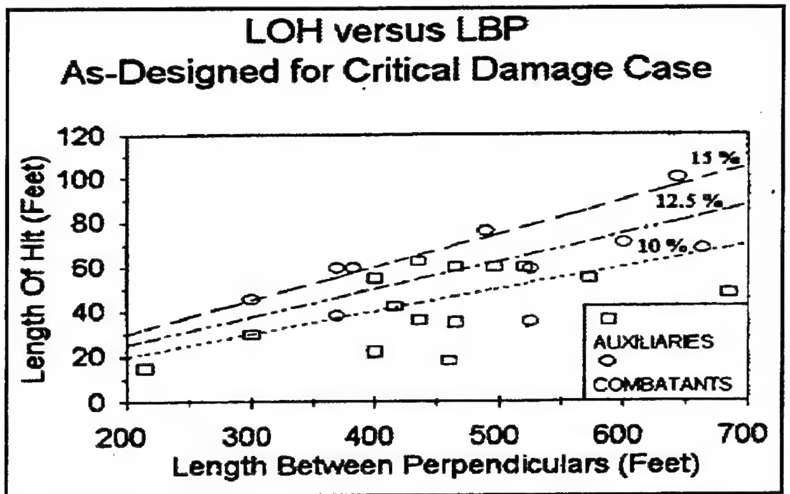

Figure 1.1. BuShips Length of Hit Study From Ref. [2]

and 12.5% for auxiliaries and, depending on bulkhead displacement,could result in a "flooded length" somewhat longer than the opening. The Navy also established a reserve buoyancy requirement, adopted from merchant practices of the day, that a margin line 3 inches below the bulkhead deck not be submerged. In 1962, a paper by T.H. Sarchin and L.L Goldberg, titled "Stability and Buoyancy Criteria for US Naval Surface Ships" recommended guidelines for ship design stability and buoyancy criteria to BuShips. The criterion developed was "empirical in nature, the result of World War II damage experience, model and full scale caisson explosion tests and general operating experience" [Ref. 3]. The Sarchin and Goldberg paper became the blueprint for the Navy's current design standards for both intact and damaged stability. These standards are delineated in NAVSEA Design Data Sheet 079-1 (DDS 097-1).

B. CURRENT DESIGN REQUIREMENTS

The following are the DDS 097-1 damaged stability criteria for category I ships, without side protection systems and over 300 feet in length. Category I includes combatants and personnel carriers, such as hospital ships and troop transports.

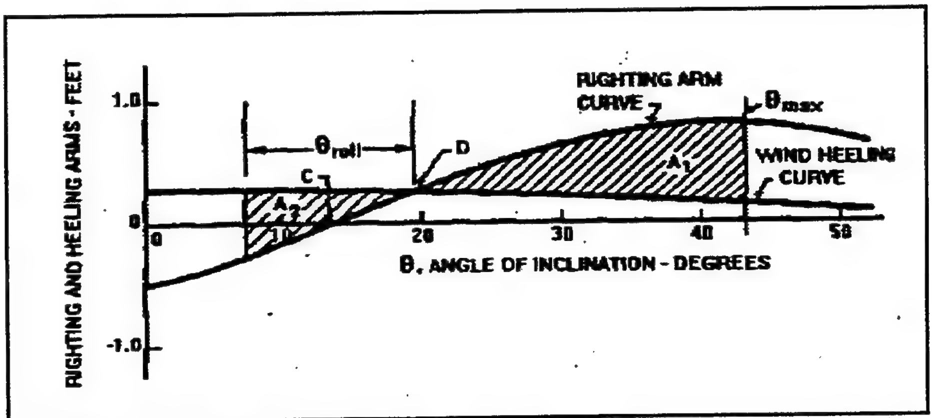

Figure 1.2. Static Stability Curve for Damaged Ship From Ref. [2]

1. The initial angle of heel, point C, does not exceed 15 degrees for operational conditions and 20 degrees for design requirements.
2. Area A_1 divided by area A_2 is greater than 1.4. The dynamic stability to absorb the energy imparted to the ship by moderately rough seas in combination with beam winds is a measure of adequacy of the stability after damage.

The DDS 097-1 criteria for compartmentation of the aforementioned category of ships is that the ship withstand rapid flooding from a shell opening equal to 15 percent of the ship's length at any point fore and aft along the length of the ship. Buoyancy criteria require that the equilibrium trim line not be above the margin line, which lies 3 inches below the bulkhead deck.

C. CURRENT DESIGN ANALYSIS PROCEDURES

The current procedure utilizes the Navy's primary naval architecture program, Ship Hull Characteristics Program (SHCP). The program consists of a geometry interpreter and several naval architecture subroutines called modules. The analysis procedure is as follows [Ref 4]:

1. Define the vessel hull form and compartmentation in SHCP.
2. Define the extent of damage longitudinally, transversely, and vertically. As noted above, maximum damage length along the longitudinal axis, for combatants and auxiliaries over 300 ft, are 15 and 12.5% of their lengths between perpendiculars (LBP), respectively. Transverse flooding may extend to, but not include, any centerline bulkhead. Vertical flooding is assumed to be unimpeded within a watertight compartment.
3. Based on the extent of damage limits and hull compartmentation geometry, identify compartment groups that would experience flooding from a specific damage scenario. Repeat the analysis for each scenario that identifies a new group of compartments.
4. Calculate the vessel's equilibrium righting arm curve, utilizing the SHCP damage stability module (DAMST), for each damage scenario.
5. Compare the results obtained with the requirements delineated in DDS 097-1.

D. FUTURE DESIGN REQUIREMENTS

In 1987, the CNO endorsed a series of operational characteristics to be incorporated into surface combatants of the year 2010 (SC2010). One of these characteristics requires that the ship have the capability to fight, even though it may have sustained hull damage and be flooded, with whichever weapons systems are available [Ref. 5]. To evaluate this capability the motion of the ship in a variety of wind, wave, operating, and flooding conditions must be evaluated. As has been shown, past design practices only address static stability and thereforee limited computer simulation tools exist to aid in the analysis. As a first step, David Taylor Research Center conducted model testing of current fleet combatants (DD963 and DDG51) in damaged conditions to determine their dynamic stability. The data, in addition to assessing current ship's dynamic stability, will be used to evaluate future prediction techniques.

E. SHORTFALLS OF CURRENT ANALYSIS ADDRESSED BY THIS THESIS

As the Navy shifts to performance-based requirements and embraces integrated design philosophies, the need for more sophisticated simulation tools grows. While the current analysis procedure and criteria have been proven to be effective they are limited in their application. An example of their limitations in evaluating performance has already pointed out in the case of SC 2010 requirements. Advantages of the progressive flooding simulation program developed in this thesis include:

1. Evaluation of threat-specific damage. Where the current procedure uses a generic floodable length requirement developed based on WW II hull forms and weapons effects, this program can use damage profiles associated with the performance-based requirements. For example, a requirement that the ship survive two anti-ship cruise missile hits, could be evaluated by simulating the damage associated with a specific type of anti-ship cruise missile.
2. Formation of flooding time line. The current procedure is designed to compute the equilibrium position of the damaged ship based purely on static geometry. The program used here finds the ship's equilibrium position based on flow rate dynamics and subsequently provides a time history of how it got there. Uses of this time line data could include the determination of when and to what extent ship's systems become affected by flooding.
3. Inclusion of dynamic damage control in the analysis. The current analysis is based on a worst case scenario, where the existence of dynamic damage control capabilities is neglected. That is an overly conservative analysis based on today's damage control technologies and procedures. By including damage control machinery and procedures in the simulation, the program described in this thesis facilitates the evaluation and comparison of their effectiveness.

II. DEVELOPMENT OF THE SIMULATION PROGRAM

A. APPROACH

This thesis primarily investigates the simulation of progressive flooding and efforts to arrest its progression. When a ship's hull is opened to the sea the watertight compartment containing the hole floods. If the watertight bulkheads bounding the compartment remain watertight, flooding is limited to this compartment. However, when the hull is holed as the result of combat damage, it is likely that the watertight bulkheads bounding the affected compartment will also suffer some damage from shock or fragmentation (or they may have ceased to be watertight as the result of abuse or improperly-performed maintenance during the life of the ship). In such cases, flooding will progress through the leaking bulkheads causing progressive flooding of additional compartments. If progressive flooding proceeds far enough, ship loss through foundering (sinking caused when the remaining buoyancy is less than the ship's weight) or loss of stability (resulting in capsize) can follow, even in cases where the initial damage was survivable. (The SS TITANIC sank as a result of progressive flooding which flooded compartments beyond those originally opened to the sea by the iceberg-caused damage.)

SIMSMART is a state-of-the-art, fluid flow simulation program. It provides excellent simulation of fluid systems consisting of components such as pipes, valves, orifices, pumps and tanks. While the program has repeatedly proven its value in the simulation of such systems, it does not deal with buoyancy – that is the fluid system made up of these components is not modeled as being afloat. This thesis extends the

utility of SIMSMART to a ship afloat in the sea by modeling the ship's watertight compartments as tanks (opened to the atmosphere) in the fluid system; the opening to the sea and damage in bounding watertight bulkheads as orifice/short pipe combinations; and pumps and de-watering systems as themselves. As flooding proceeds into the initially damaged compartment/tank as well as into those adjacent to it, naturally, the ship's draft will change as it takes on the weight of the flood water. Since SIMSMART cannot deal directly with buoyancy, the Naval Architecture aspects of the ship, which govern its condition of flotation, are treated outside the SIMSMART program – in this case by using a dynamic link to a Microsoft Excel spreadsheet.

B. HULL FORM

The hull form used in the development and testing of the program was the Wigley hull (Figure 2.1). It was chosen due to its ease of analytical representation. The thought, at the time of this decision, was that if the program could be built analytically (i.e. naval architecture parameters calculated by program) it would be easily reconfigurable for operation with existing tabular data (for example draft vs. moment to trim an inch tables for a specific ship class). The offsets of the Wigley hull are:

$$y = \pm (B/2)(1 - ((T - z)^2 / T^2))(1 - 4(x^2 / L^2)) \qquad (1)$$

Where:

x = longitudinal distance from midships
y = transverse distance from centerline
= offset
z = height above keel

B = beam (maximum)
T = draft (maximum)
L = length between perpendiculars

The dimensions and initial conditions chosen for the model were:

B = 37.5 ft initially	upper deck to keel = 40 ft
T = 30 ft initially	max breadth of upper deck = 40 ft
L = 400 ft	

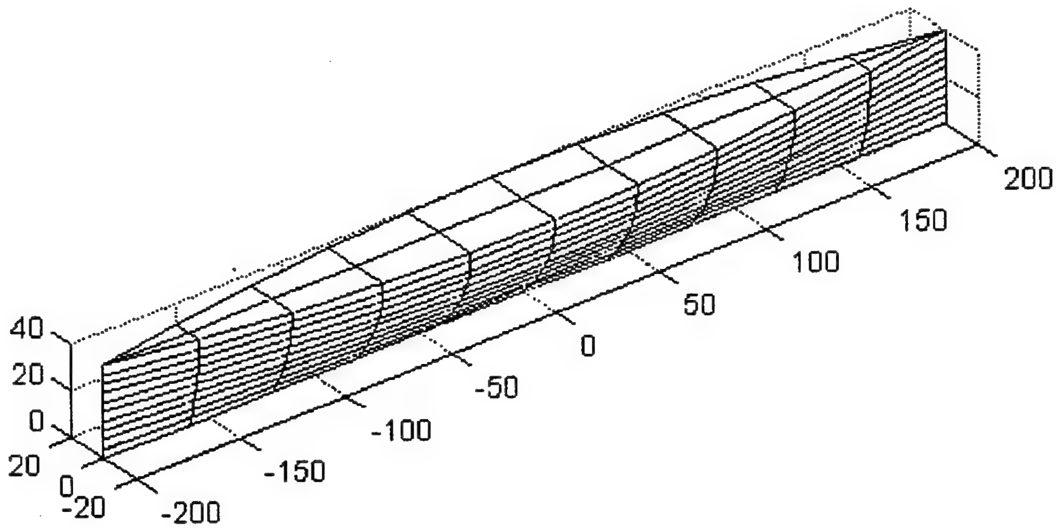

Figure 2.1. Isometric View of Wigley Hull

The hull was subdivided into 10 longitudinal compartments of various lengths.

Bulkhead location with respect to midships (feet)

Compartment A	200 to 150	Compartment F	midships to -25
Compartment B	150 to 120	Compartment G	-25 to -90
Compartment C	120 to 80	Compartment H	-90 to -130
Compartment D	80 to 50	Compartment I	-130 to -160
Compartment E	50 to midships	Compartment J	-160 to –200

C. SIMSMART

SIMSMART is a C++ based, fluid flow analysis program developed by Applied High Technology (AHT) Corp of Montreal, Canada. The backbone of the program is its capability to determine static pressures at various locations in a model. Once static

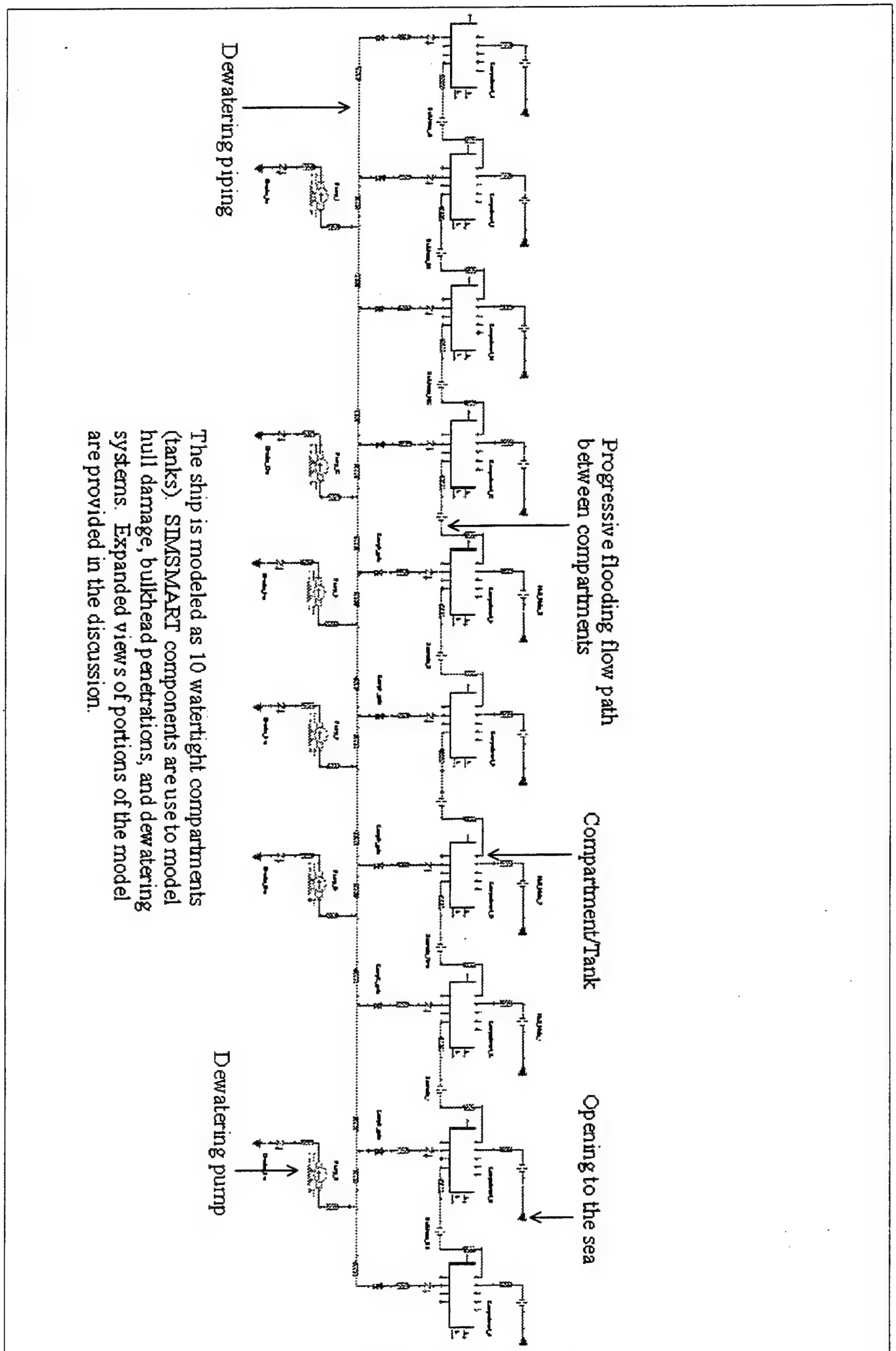

Figure 2.2. SIMSMART Wigley Hull Model

pressures are calculated they are applied to components of the model, via the Bernoulli equation, to determine flow parameters. SIMSMART will carry out all flow analysis associated with the simulation tool developed in this thesis.

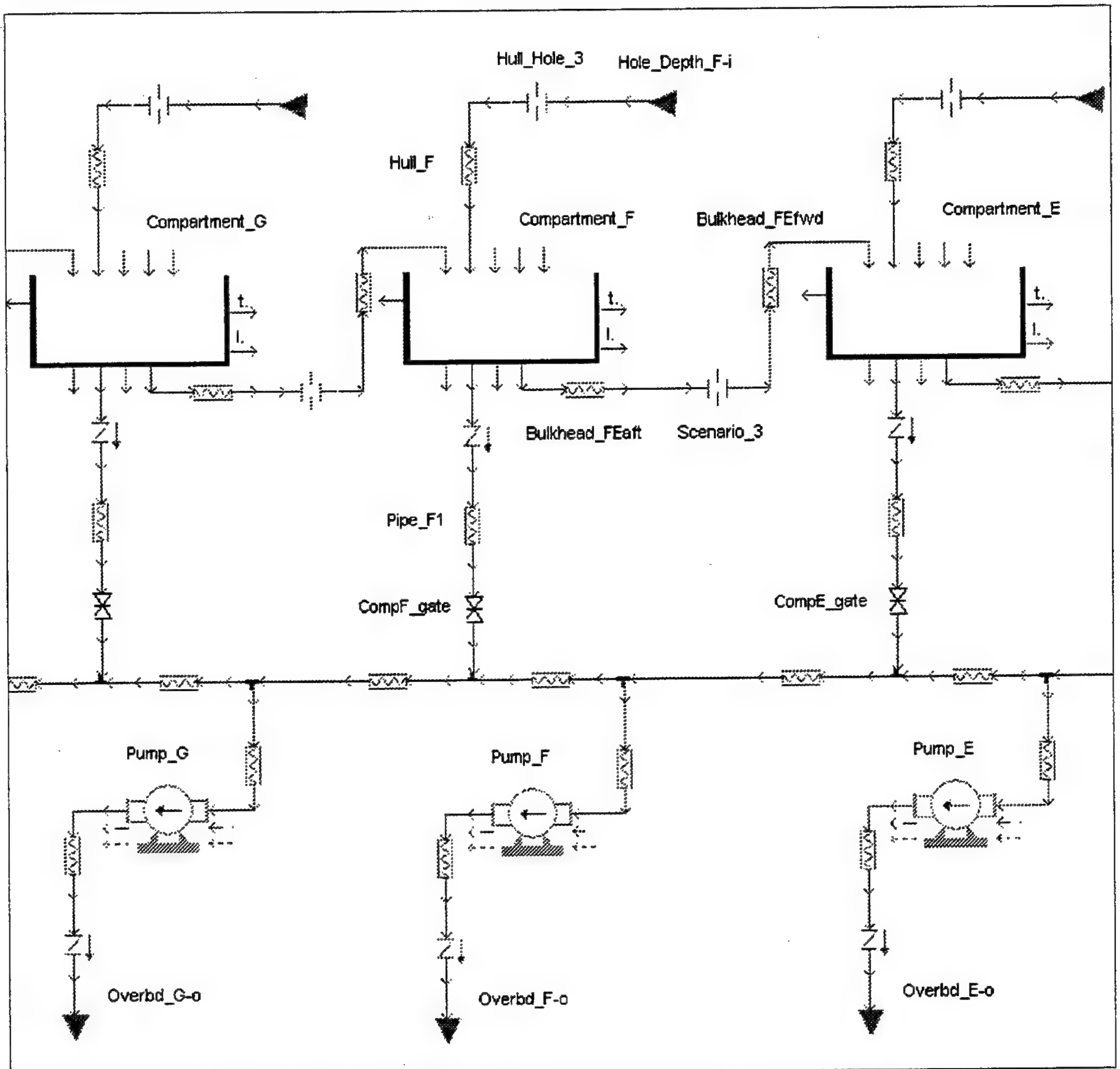

Figure 2.3. Section of SIMSMART Wigley Hull Model

1. Model Components

Components are selected from pre-existing SIMSMART Marine and NAVSEA libraries or created using the SMART MODEL program. The SMART MODEL program provides a template for creating the C++ code, icon, and variable forms needed to build a component. Pre-existing components are tailored to the simulation by entering component specific parameters via Visual Basic Forms.

Components used in this model, shown in Figure 2.2 and listed in Appendix A, consist of input sources, pipes, tanks, check valves, gate valves, pumps, and output sources.

Input sources, such as "Hole Depth F-I" shown in Figure 2.3, provide the static pressure at the hull hole. The hole is initially10 ft below the waterline, so:

$$
\begin{aligned}
P_{static} &= P_{atm} + \rho\, g\, h \qquad (2)\\
&= 14.7 \text{ psi} + (62.4 \text{ lb}_m/\text{ft}^3)(32.2 \text{ ft/s}^2)(10 \text{ ft})(1 \text{ lb}_f \text{ s}^2/32.2 \text{ lb}_m \text{ ft})(\text{ft}^2/144 \text{ in}^2)\\
&= 19.03 \text{ psi}
\end{aligned}
$$

Pipes and orifices are used in combination to model holes in both the hull and bulkheads. Hull holes, such as pipe "Hull F" and orifice "Hull Hole 3", are circular, 12 inches in diameter, and initially located 10 ft below the waterline. Bulkhead holes, such as pipes "Bulkhead Fefwd" and "Bulkhead Feaft" and orifice "Scenario 3", are circular, 6 inches in diameter, and initially located 17 ft above the keel. Hole sizes and depths were chosen arbitrarily and not as the result of research on hull damage. A discharge coefficient of 0.62 was selected to represent a sharp edged hole [Ref. 6]. Recall that the discharge coefficient is an empirical factor and therefore yields only approximate results. With this in mind, selection of higher valued discharge coefficients as a rule will provide

conservative scenario results. Flow through holes in tanks is governed by the short tube orifice equation:

$$Q = C_d A(2gh)^{0.5} \tag{3}$$

Flow through orifices in SIMSMART, however, are calculated based on Bernoulli Obstruction Theory:

$$Q = C_d A(2gh/(1-\beta^4))^{0.5} = \alpha A(2gh)^{0.5} \tag{4}$$

Where:

$Q =$ flow rate

$A =$ cross-sectional area of the hole

$C_d =$ discharge coefficient

$g =$ gravitational constant

$h =$ head

$\beta = d/D$ (d = orifice diameter, D = pipe diameter)

$\alpha = C_d/(1-\beta^4)$ flow coefficient

It can be seen from the two flow equations above that if the flow coefficient of the SIMSMART orifice is equal to the discharge coefficient desired by the programmer for the short tube orifice, the simulation will be calculating the flow through a hole in a tank. Obtaining the desired flow coefficient is dependent on the selection of the proper β ratio, and thereforee the proper pipe diameter since the orifice diameter is fixed by the hole size required. Errors due to pipe losses are made negligible by using extremely short pipe lengths, 1/3 of an inch. Because the model has hull and bulkhead holes built into every tank, the pipe parameter "mlf_clg", clog percentage, is set to 100% on each inactive hole to prevent flow.

In addition to their use in modeling holes, pipes are used to form the dewatering system. This system consists of 10 compartment suction lines, a dewatering main, and 6

pumps with suction and discharge lines. Each compartment suction line consists of a check valve, section of pipe and gate valve. The dewatering main runs the length of the ship and connects with compartment and pump suction lines via three way tees. All pipes used in the model are 6 inch, CuNi, chosen from the SIMSMART library. The library provides all parameters relevant to fluid flow within the chosen pipe type (surface roughness for example). Model-specific parameters such as length, inlet height, outlet height, and number and types of bends are listed in Appendix B.

Atmospheric tanks ("Compartments A through J") are, as their names imply, used to model flooding compartments. The use of atmospheric tanks in this model is appropriate because, while watertight compartments do not allow for fluid flow through bulkheads, they do allow for unrestricted flow vertically. Tank geometry is defined in SIMSMART through the use of height vs. volume data. Linear interpolation is performed to obtain values in between those inputted. For the Wigley hull, height vs. volume data was obtained by integration of the analytical formula:

$$\text{Vol}(x,z) = 2 \iint (B/2)(1 - ((T - z)^2 / T^2))(1 - 4(x^2 / L^2))\, dxdz \qquad (5)$$

where the upper limits of integration are

$$x = x_h \qquad z = Z$$

and the lower limits of integration are

$$x = x_l \qquad z = 0$$

$$\text{Vol}(x,z) = B((Z^2/T) - (Z^3/(3T^2)))((x_h - x_l) - 4(x_h^3 - x_l^3)/(3L^2)) \qquad (6)$$

A Matlab program, available in Appendix C, was used to calculate the height vs. volume values for each of the compartments.

"Pumps B, D, E, F, G, and I" model six permanently installed 1200 gal/min positive displacement pumps. Each pump is piped to the main dewatering header and its

own overboard discharge. Pumps were activated manually in the scenarios carried out in this thesis, but the program is capable of operating them in automatic based on control logics. Pump operating parameters include efficiency and overload set points.

Output sources, such as "Overbd F-o", provide the static pressure at the overboard discharges of the pumps. The holes are each located 5 ft below the waterline initially, so by application of Equation 2, their initial static discharge pressure is 16.87 psia

D. NAVAL ARCHITECTURE

While SIMSMART is an excellent fluid system analysis tool, it is not configured to undertake calculations removed from the flow process. For this reason a second computer program, which could interface with SIMSMART and perform the required Naval Architecture calculations, was needed. Microsoft Excel was chosen predominantly because of its compatibility with the SMART ACCESS program, an interface program developed by AHT Corp.. SMART ACCESS allows Excel cells to receive continuous updates of SIMSMART parameters. Additionally it provides for macro-initiated updates of SIMSMART parameters from Excel.

As previously mentioned, the simulation performed in this thesis is based on the analytical form of the Wigley hull and therefore the Excel spreadsheet is designed to calculate all relevant naval architecture parameters. Although not demonstrated, the spreadsheet can be reconfigured for operation with existing tabular data (for example draft vs. moment to trim an inch tables for a specific ship class).

1. Calculations

Calculations within the spreadsheet, provided as Appendix D, commence with receipt of values of compartment flooding height and volume from SIMSMART via SMART ACCESS.

The longitudinal, x axis, centroid of the water in each compartment is determined by:

$$x_{cen} = \frac{\iiint x\,dv}{\text{volume}} = \frac{(x^2_h - x^2_l)/2 - (x^3_h - x^3_l)}{(x_h - x_l) - (x^3_h - x^3_l)} \quad (7)$$

The symmetry of the Wigley hull leads to a longitudinal centroid that is only a function of bulkhead location (i.e. independent of water depth and therefore constant throughout the simulation). This would not be the case had the affects of trim been applied to the flooded water volume (the program does not account for this affect).

The vertical, z axis, centroid of the water in each compartment is determined by:

$$z_{cen} = \frac{\iiint z\,dv}{\text{volume}} = \frac{2((Z^3/3)-(Z^4/320)((x_h - x_l) - (x^3_h - x^3_l)/120000)}{\text{volume}} \quad (8)$$

The vertical centroid is dependent on the values of compartment water height and volume obtained from SIMSMART and therefore, like all of the formulas that follow, will be updated with each SIMSMART iteration.

The transverse, y axis, centroid of the water in each compartment is fixed at centerline for the simulation. This can be attributed to the symmetry of the Wigley hull and the lack of longitudinal bulkheads. This was not an oversight of the thesis, but rather was done intentionally to test the process in 2 dimensions before expanding it to the more complex and less intuitive 3 dimensional case. (It also reflects the fact that U.S. Navy practice is to avoid longitudinal bulkheads in its combatant ships.)

The initial displacement is calculated by using Equation 6 in concert with division by the density of water. The vertical height of the center of gravity of the intact ship with respect to the keel, KG, was initially set to 25 ft, a value approximately equal to that calculated for a Wigley hull of constant density. Revised displacement is calculated by summing tank volumes, received from SIMSMART, dividing by water density, and adding the value to the initial displacement.

The revised draft is calculated by using the revised displaced volume as input to a third order polynomial approximation of the hull's draft vs. displaced volume curve. The polynomial was computed using the Matlab program provided in Appendix E.

KB, the vertical height of the center of buoyancy with respect to the keel, is calculated using the revised draft as input to Equation 8.

BM_L, the vertical height of the longitudinal metacenter above the center of buoyancy with respect to the transverse axis, is determined as follows:

$$BM_L = I_L / \text{displaced volume} \tag{9}$$

where I_L is the second moment of the waterplane area about the transverse axis:

$$I_L = \iint x^2\, dy\, dx = 85{,}333{,}333.3(1-(40-\text{draft})^2/1600) \tag{10}$$

The revised KG is calculated by summing the moments created by the flooding in each compartment (z centroid times water weight), adding the product of initial displacement and KG, and dividing by revised displacement.

The value of GM_L, the vertical height of the longitudinal metacenter above the center of gravity with respect to the transverse axis, can then be computing according to:

$$GM_L = KB + KM_L - KG \tag{11}$$

MCT 1in (the change in moment required to trim the hull by an inch), trim, and LCG (longitudinal center of gravity), are calculated according to the following equations:

$$\text{MCT 1in} = D * GM_L / (12 * L) \tag{12}$$

$$\text{Trim} = \Sigma (W * X) / \text{MCT 1in} \tag{13}$$

$$LCG = LCG_o * D_o + \Sigma (W * X) / D \tag{14}$$

where: W = individual compartment's flood-water weight

X = individual compartment's flood-water x centroid

D = hull displacement (D_o is initial)

$LCG_o = 0$ (for Wigley Hull due to symetry)

Note that calculations of terms from KB to MCT 1in would not be required in the case where tabular data of a specific ship was available.

The depths of all hull holes and overboard discharges are determined geometrically, based on hull position, revised draft, LCG and trim. Equation 2 is applied to each, resulting in revised pressure values. SIMSMART input and output sources are updated with these pressures upon activation of the Excel macro provided in Appendix F.

E. SIMULATION PROCESS SUMMARIZED

Upon entering the run time environment, SIMSMART calculates the pressure at each node of the model. These pressures are used to evaluate the flow parameters of each model component according to the Bernoulli theory. Water accumulation in the tanks is then computed by multiplying the net flow into the tank by the time step of the iteration (the time step is the amount of real time being simulated in each iteration). Tank levels are computed using the height vs. volume information provided when building the

model. Tank volume information is then passed to the Excel spreadsheet via SMART ACCESS where it is used to calculate the revised pressures at each hull hole and overboard discharge. Activation of the transfer macro revises the pressures in SIMSMART, effectively imposing the effects of sinkage on the fixed coordinate SIMSMART model.

III. SCENARIOS

To assess the ability of the simulation process to accurately model progressive flooding, several scenarios were developed. Each scenario began with the same initial conditions, outlined in subsections II.B. and C. Scenarios were chosen not only to test the capabilities of the program, but also to demonstrate its utility as a design tool.

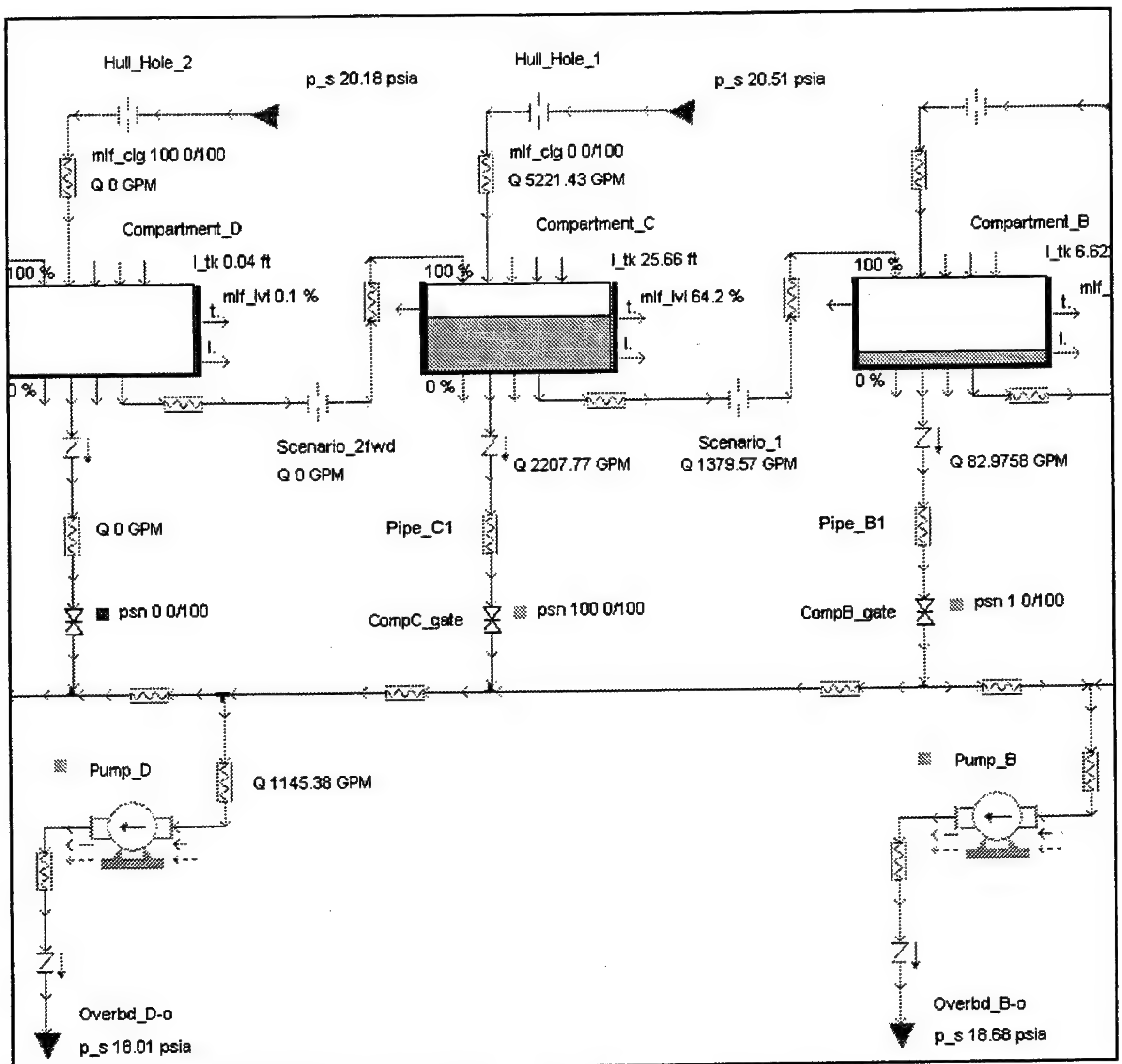

Figure 3.1. View of Scenarios 1, 1A, and 1B

A. SCENARIO CONCEPTS

1. Scenarios 1, 1A, and 1B

Each of these three scenarios has Compartment C as the sight of primary flooding with progressive flooding into Compartment B. As described below, the difference among the scenarios lies in the use of the installed dewatering systems. These scenarios will not only be used to validate the program, but will also show its utility in evaluating the effectiveness of various damage control procedures.

In scenario 1 no dewatering equipment is used. This should result in the fastest time to either equilibrium or sinkage, and provide a timeline for the worst case scenario.

Scenario 1A involves the same compartments, but in this case 3 pumps (pumps B, D, and E) are used to attempt to dewater the spaces. The use of pumps is indiscriminant, in other words each takes suction off of the dewatering main with compartment suction lines open. In theory the results should be better than scenario1, but the final outcome is unclear.

Scenario 1B also uses 3 pumps, but in this case it is realized that the pumps are unable to dewater both spaces and that an effective procedure may be to allow the primary compartment to flood while keeping the water level in the secondary compartment as low as possible. This is accomplished by throttling the CompB gate and CompC gate valves to regulate the flow out of the compartments.

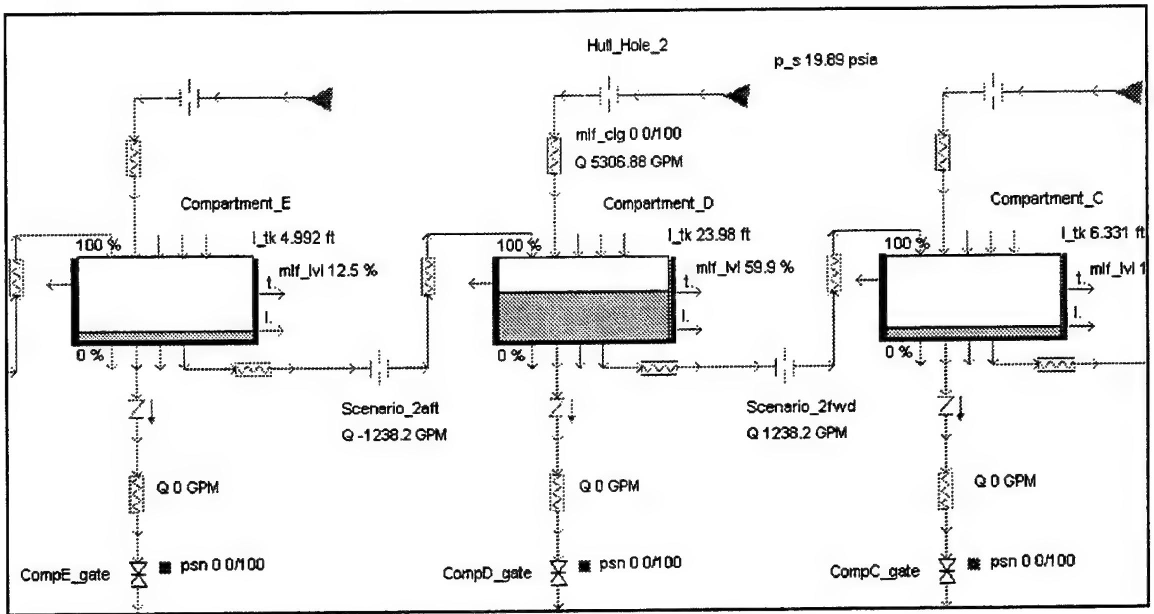

Figure 3.2. View of Scenario 2

2. Scenario 2

This scenario involves progressive flooding of two secondary compartments, Compartments C and E, caused by hull damage to Compartment D. No dewatering equipment is used, so as with scenario1, it is simulation of the worst case. The results of this scenario will be useful in comparisons with no pump runs of scenarios 1 and 3. Additionally, it should give insight into errors caused by the program's current limitation in accounting for the effects of trim internally to the hull, as explained in subsection B.4 of this chapter.

3. Scenarios 3, 3A, and 3B

As in scenario 1, each of the three scenarios has the same primary, Compartment F, and secondary, Compartment E, flooding sites. But as described below, the difference between the scenarios lies not in the use of the installed dewatering systems, but rather

their capacities. These scenarios will be used not only to validate the program, but will also show its utility in selection and evaluation of damage control systems.

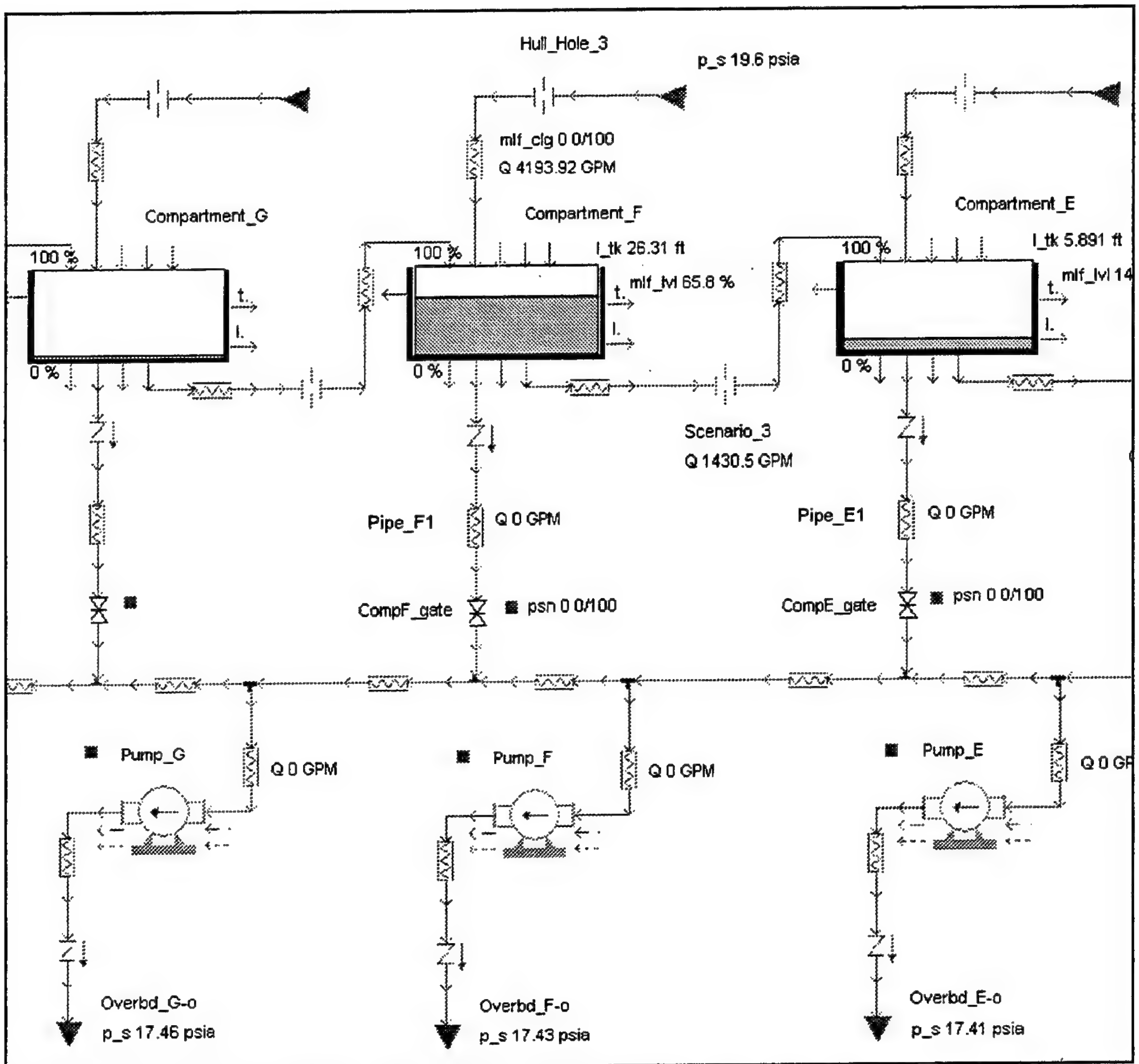

Figure 3.3. View of Scenarios 3, 3A, and 3B

As in scenarios 1 and 2, scenario 3 does not utilize dewatering equipment. The results of this run, however, serve not only as a worst case timeline, but also as a data source for damage control system selection in scenarios 3A and B.

Scenario 3A uses data from scenario 3 to select pumps capable of dewatering the primary compartment and thereby preventing progressive flooding.

Scenario 3B also uses scenario 3 data, but in this case pumps are selected to keep up with progressive flooding into the secondary compartment.

B. SCENARIO RESULTS

The results provided in the following subsections were compiled by pausing each simulation at various time intervals and recording relevant data.

Time intervals were chosen based on the rate of change of model parameters. For example, when a compartment began to flood and no pumps were on, parameters such as tank volume and level were changing rapidly and therefore required recording every minute of simulated time (Figure 3.4). In contrast, when a scenario approached the equilibrium condition changes were so minute that values needed only to be recorded every 15 minutes of simulation time to show significant changes.

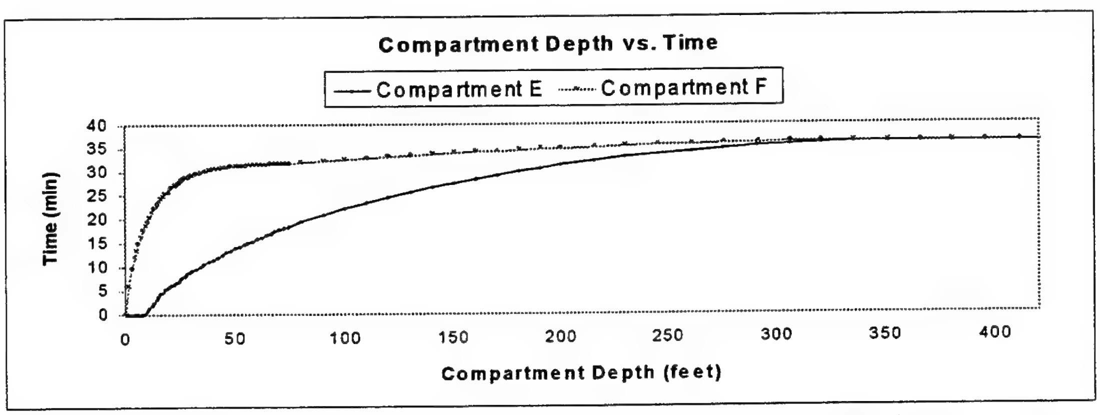

Figure 3.4. Changes in Values vs. Time Exemplified

SIMSMART allows simulations to be run faster than real time by selection of a speed ratio. The speed ratio is equal to the simulated time divided by the real time (i.e. at a speed ratio of 6, 1 minute of simulation takes 10 seconds). Each scenario began at a relatively low speed ratio (3 to 6). As with the time interval, as changes in parameters

took longer, the speed ratio was increased. The largest speed ratio used was 15.

Relevant data was determined to consist of mean draft, forward draft, aft draft, GM (transverse), displacement, LCG, flow rate through hull hole, flow rate through bulkhead hole/s, primary and secondary compartment flooding levels and volumes, pump status, valve status, simulation time, and simulation speed ratio. Each scenario's respective appendix contains the relevant data in tabular form.

1. Scenario 1

Scenario 1 ran for 37 minutes before the margin line was submerged and the simulation was stopped (Figure 3.5).

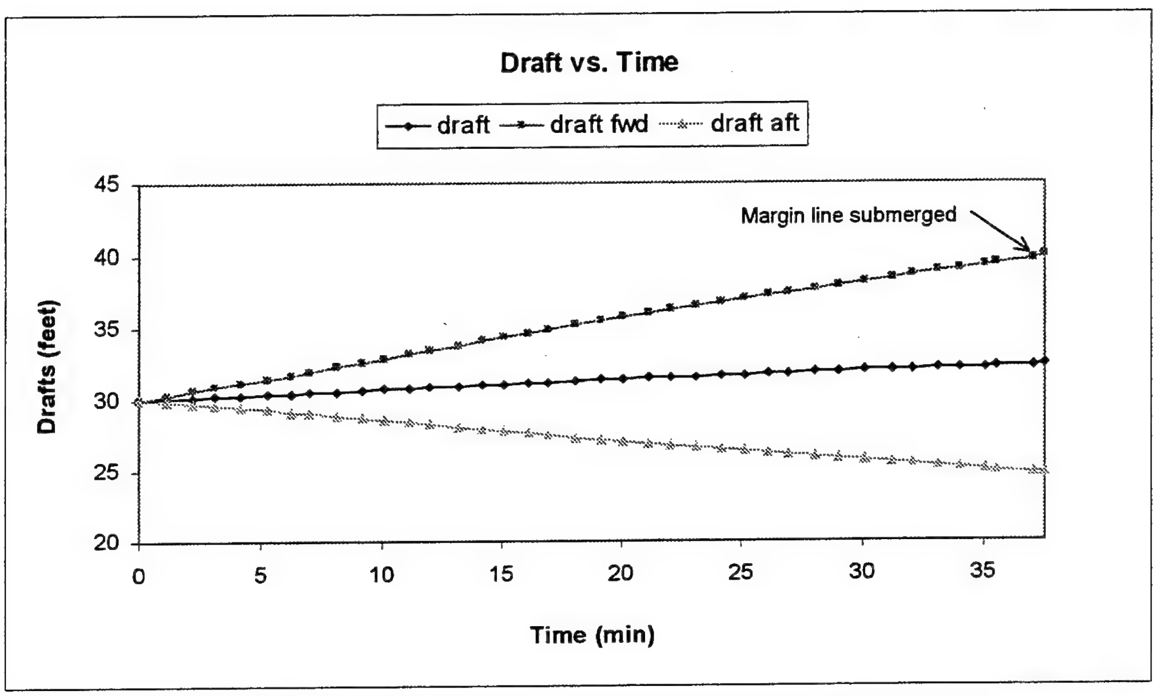

Figure 3.5. Scenario 1 - Draft vs. Time

From the tabularized data in Appendix G and Figure 3.6 it can be seen that the flow rate through the hull hole started at approximately 5900 gpm and immediately began to slowly increase as the result of hull sinkage. This yielded an almost linear, slightly

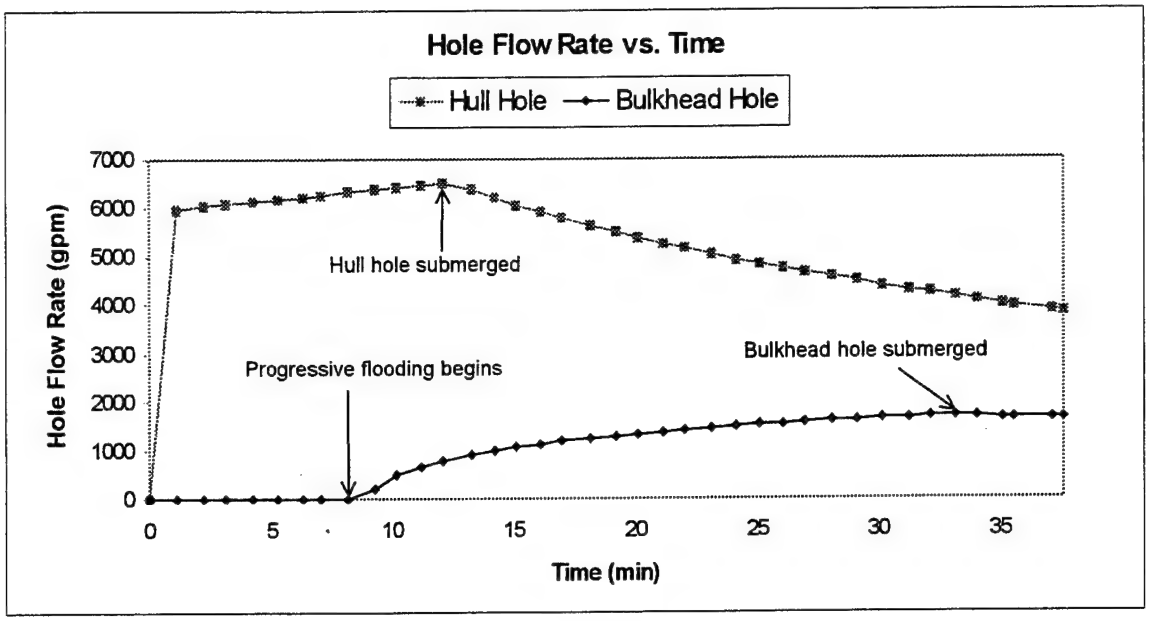

Figure 3.6. Scenario 1 – Flow Rate vs. Time

increasing, rate of change in compartment C water volume (Comp C vol.) with respect to time (Figure 3.7). The rate of change in water level (Comp C level), however, was strongly nonlinear due to the geometry of the hull (Figure 3.8). Initially the curve's slope was steep due to the narrowness of the compartment near the keel. As the compartment

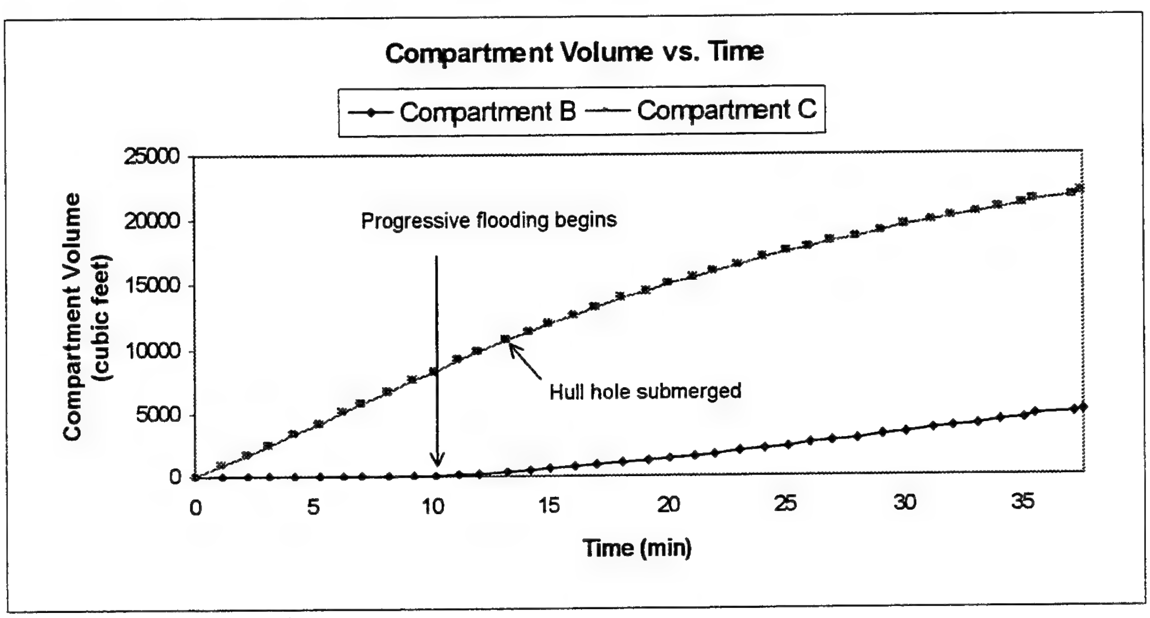

Figure 3.7. Scenario 1 – Compartment Volume vs. Time

widened it took more water to create the same change in level, which accounts for the decreasing of curve slope even with increasing flow rate.

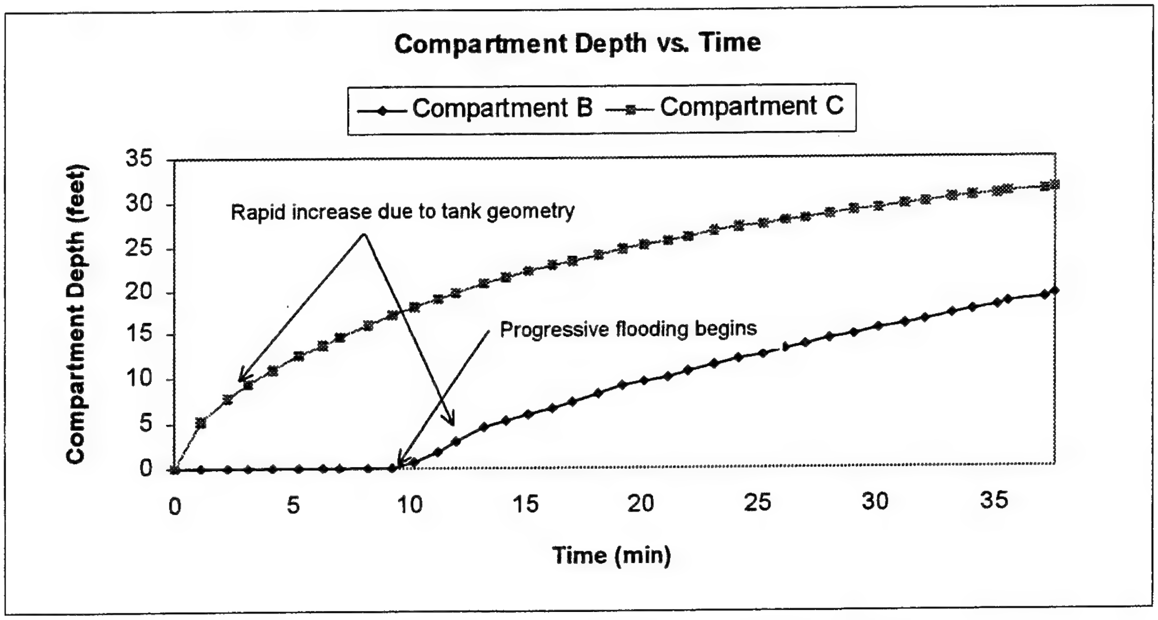

Figure 3.8. Scenario 1 – Compartment Depth vs. Time

Approximately 8 ½ minutes into the simulation the bulkhead hole, at a height of 17 feet, was submerged on both sides and progressive flooding began. The bulkhead hole flow rate, as was shown earlier, was proportional to the square root of the height of water above the hole (Comp C level – hole height). It can be seen in Figure 3.6 that even though the bulkhead flow rate was increasing, it was doing so at a decreasing rate. This was due the decreasing rate of change in Comp C level, Figure 3.8. The flow rate into Comp C was increasing due to the increased depth of the hull hole, but not at a rapid enough rate to offset the effects of widening of the compartment with increased level and out flow through the bulkhead hole.

The hull hole became submerged on both sides at approximately 12 minutes and was immediately followed by a continuous decrease in flow rate. This was the result of decreased differences in head on either side of the bulkhead hole (i.e. water level in the

compartment was increasing faster than the bulkhead hole depth). At 33 minutes the bulkhead hole became submerged on both sides resulting in decreased flow rate for similar reasons (i.e. rate of change of Comp B level was greater than that of Comp C).

At 37 minutes the margin line was submerged and the simulation stopped. The data obtained during the simulation has provided valuable insight into the events leading up to the submerging of the margin line. The foundering of the hull should not be surprising based on the arbitrary selection of the hull's bulkhead locations and the placement of holes in this scenario in a longitudinal region traditionally associated with minimum floodable lengths.

Common occurrences discussed in this subsection, such as: initial increase in hull hole flow rate due to increasing depth of hole; rapid initial increase in compartment water level due to hull geometry; decrease in flow rate due to total submergence of hole; etc., will not be readdressed in subsequent subsections unless such a discussion would provide new insight.

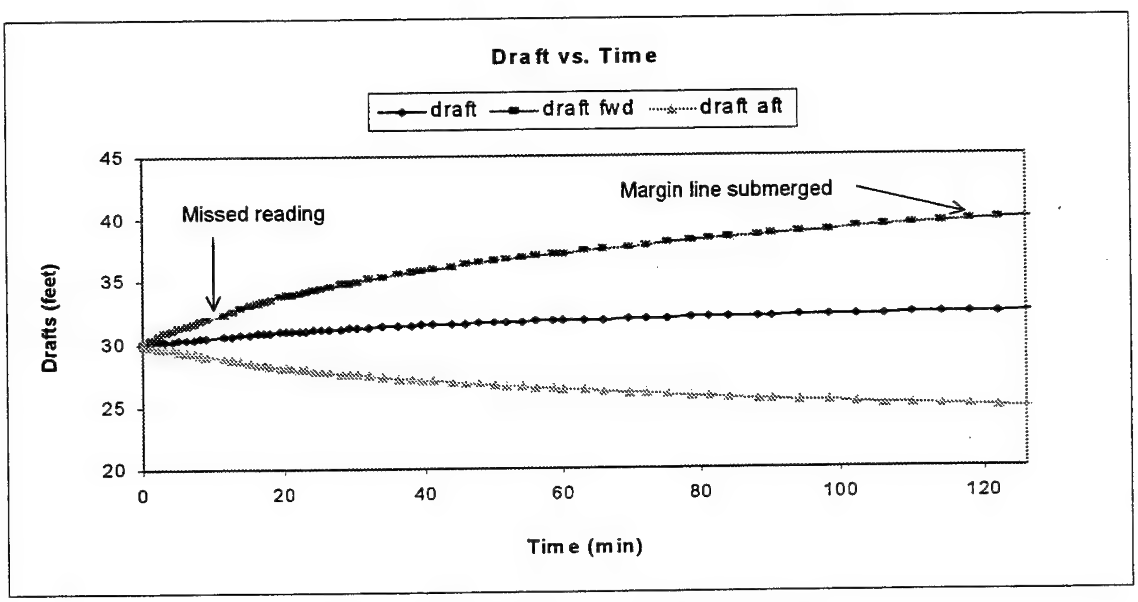

Figure 3.9 Scenario 1A – Draft vs. Time

2. Scenario 1A

Scenario 1A ran for 118 minutes before the margin line was submerged and the simulation was stopped (Figure 3.9).

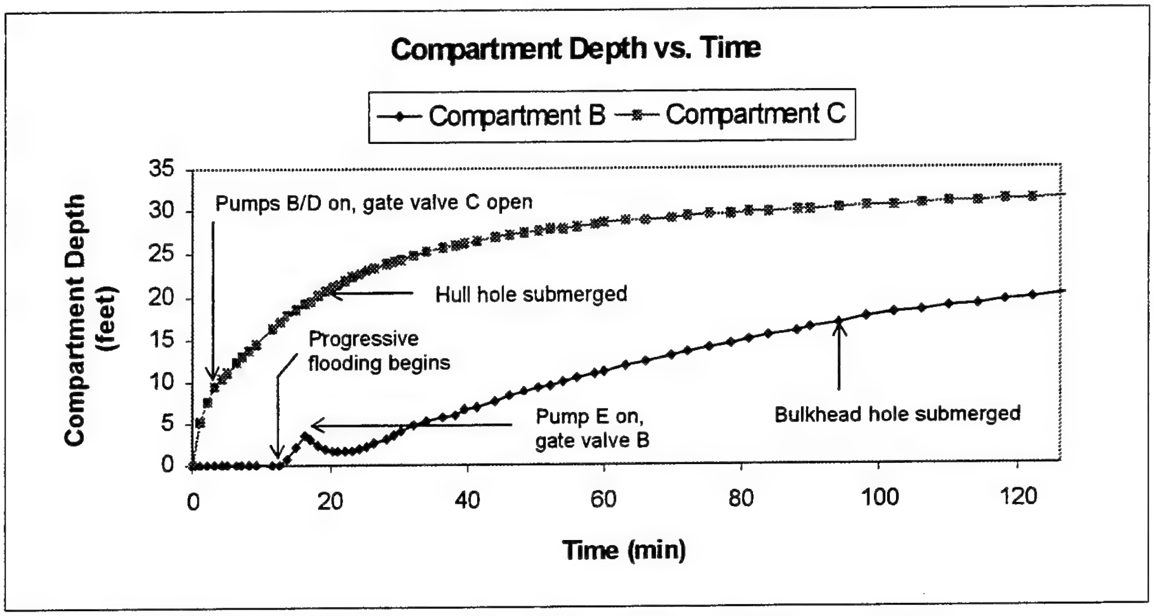

Figure 3.10 Scenario 1A – Compartment Depth vs. Time

From the tabularized data in Appendix H and Figures 3.10, 11, & 12 it can be seen that for the first 3 minutes of scenario 1A the results obtained were identical to those of scenario 1, as expected. At that time gate valve B was opened and pumps B and D were turned on, effectively decreasing the net flow rate into compartment C. The pumps, each operating at a flow rate of 1145 gpm, were not able to overcome the continuously increasing hull hole flow, but did slow the rate at which Comp C level increased (Figure 3.10). This in turn prolonged the time it took for progressive flooding to begin.

Progressive flooding began at 12 min, approximately 4 minutes later than it did in scenario 1 (Figure 3.12). Flooding of compartment B continued unimpeded until gate valve B was opened and pump E was turned on at 16 ½ minutes. By this time Comp B level had reached 3 ½ feet and Comp C level was at 19 feet. Because both compartments

were being dewatered by a common dewatering main and the water level in compartment C was higher, the flow rate through of pipe C1 was greater than that out of pipe B1 (i.e. greater pressure at pipe inlet with common pressure in dewatering main).

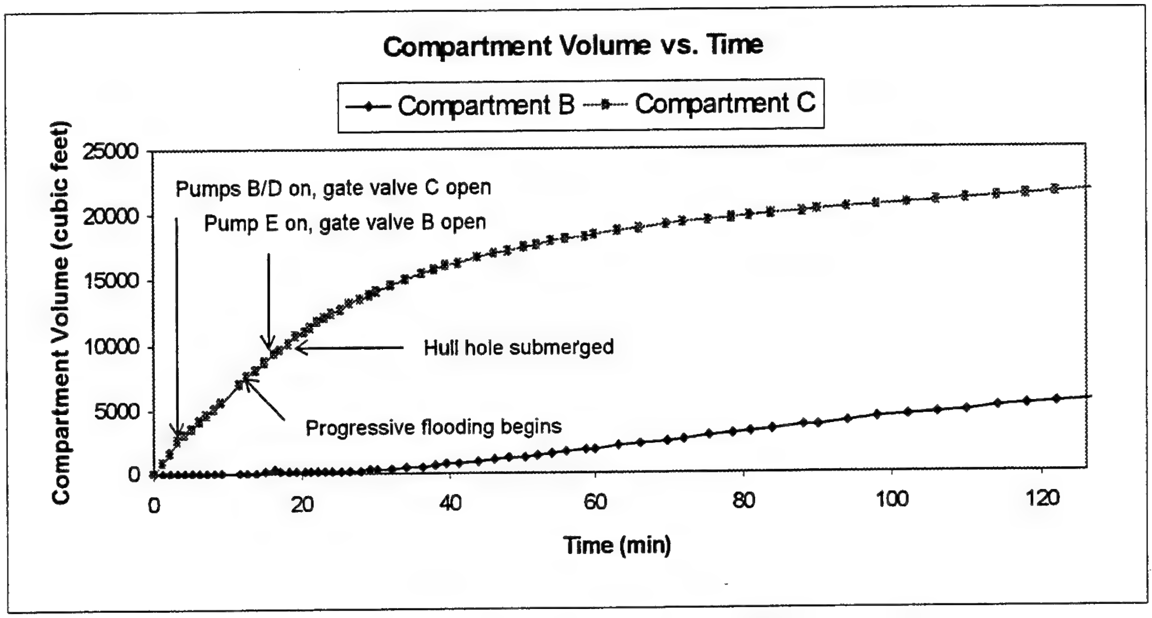

Figure 3.11 Scenario 1A – Compartment Depth vs. Time

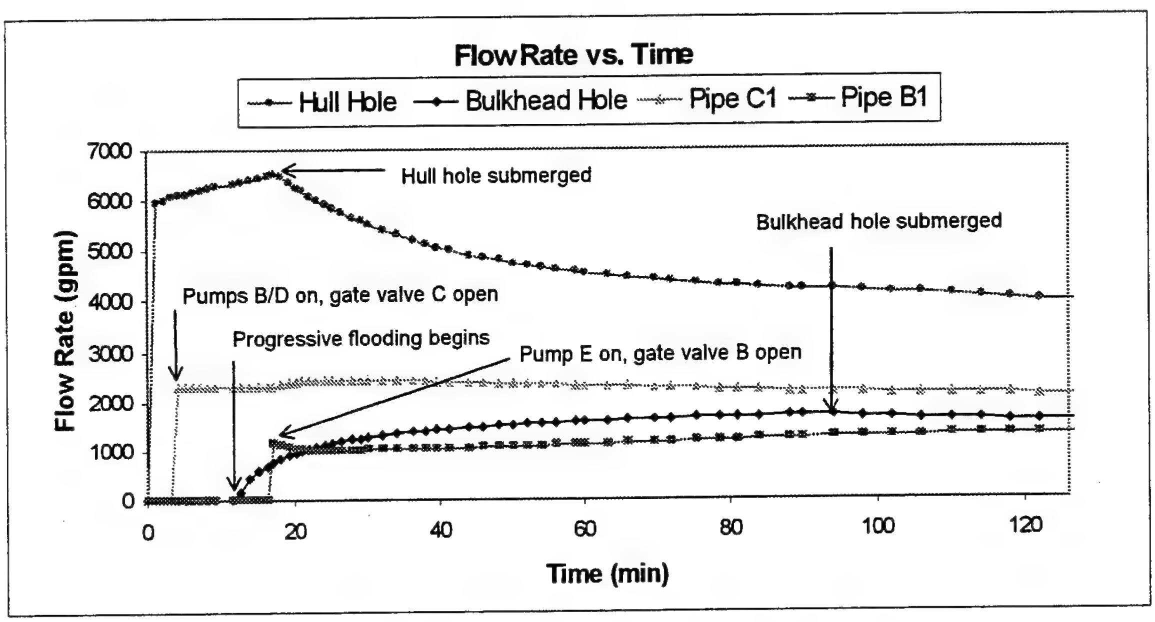

Figure 3.12 Scenario 1A – Flow Rate vs. Time

A decrease in flow rate through pipe B1 occurred immediately after progressive flooding commenced due to the negative net flow rate into compartment B (Comp B water level was decreasing, Figure 3.10). Because the pumps operated at fixed flow rates, the decrease in flow through pipe B1 resulted in an equal but opposite increase in flow through pipe C1 (Figure 3.12). At 18 minutes the hull hole was submerged on both sides, 6 minutes later than it was in scenario 1.

The net flow rate into compartment B became positive at 21 minutes, causing Comp B level increase. At 27 minutes the rate of increase in Comp B level exceeded that of Comp C and flow rate through pipe B1 began to increase.

At 94 minutes the bulkhead hole was submerged on both sides and at 118 minutes the margin line was submerged (over 1 hour and 20 minutes later than it was in scenario1). The results of this scenario show that indiscriminant use of the modeled damage control system will not necessarily prevent the hull from foundering, but will extend its life significantly.

3. Scenario 1B

Scenario 1B ran for 205 minutes before equilibrium was achieved at a maximum forward draft of 37.4 feet (Figure 3.13); ship loss did not occur.

From the tabularized data in Appendix I and Figures 3.14, 15, 16 & 16a it can be seen that for the first 24 minutes of scenario 1B the procedures used and the results obtained were identical to those of scenario 1A. At that time gate valve C was throttled to 30 %, causing a decrease in flow through pipe C1 and a corresponding increase in flow through pipe B1. That increase placed pipe B1's flow rate nearly equal to that of the

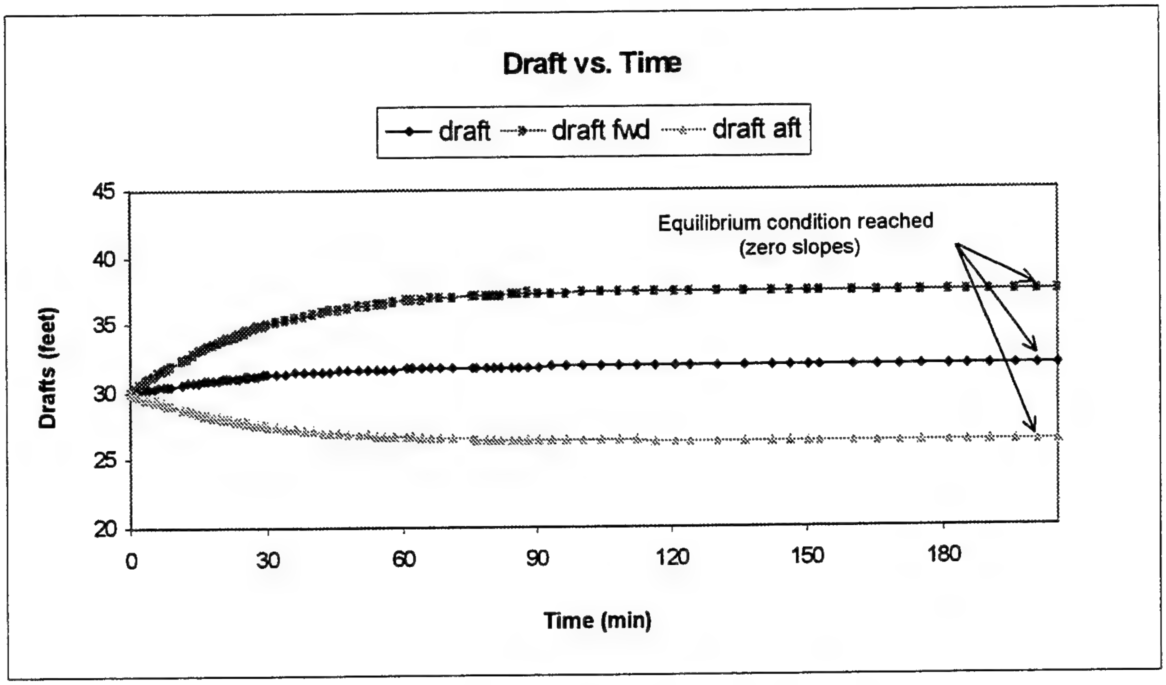

Figure 3.13 Scenario 1B – Draft vs. Time

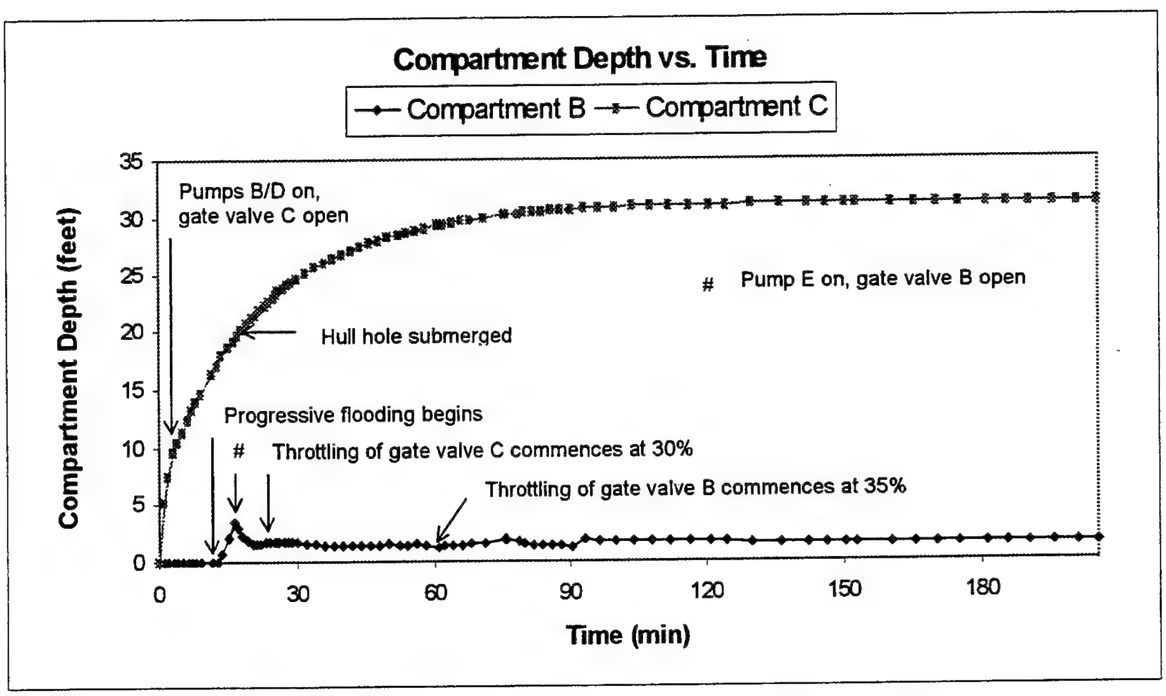

Figure 3.14 Scenario 1B – Compartment Depth vs. Time

bulkhead hole (Figures 3.16 and 3.16a), resulting in a net flow rate into compartment B of approximately zero. Gate valve C was throttled from 30 to 9 %, over the simulation period of 24 to 56 minutes, in increments necessary to maintain the flow rate out of pipe B1 nearly equal to that of the bulkhead hole.

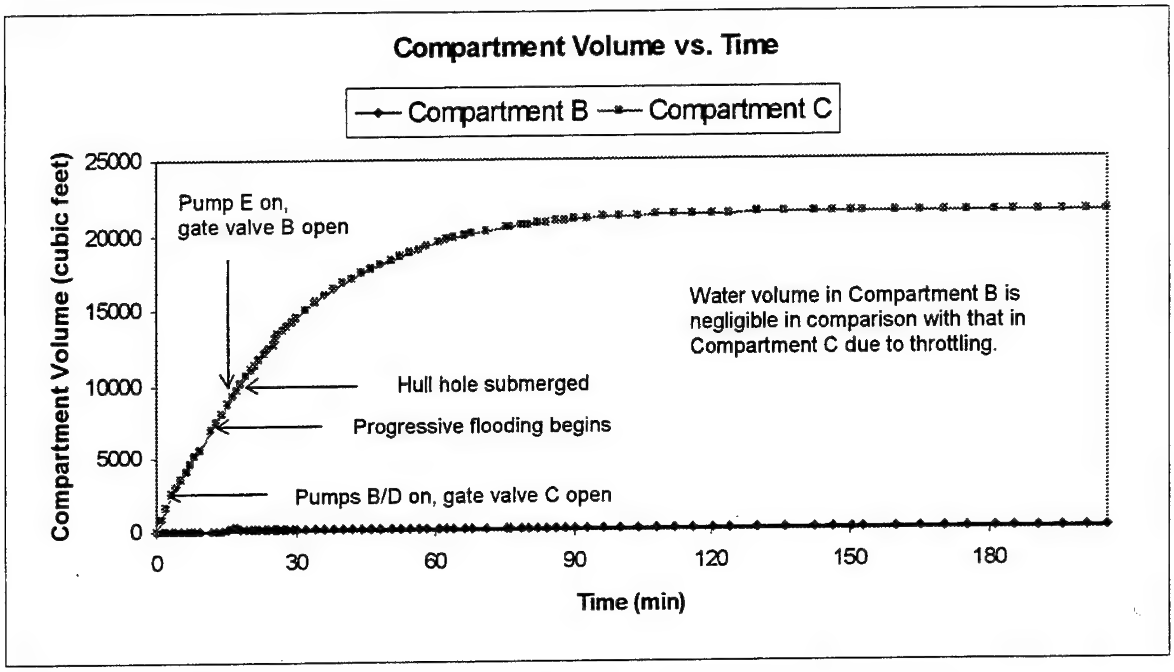

Figure 3.15 Scenario 1B – Compartment Volume vs. Time

Several phenomena occurred as the result of the throttling process: Comp B level was maintained at approximately 1 ½ ft (Figure 3.14); Comp B vol. was maintained at approximately 110 ft^3 (Figure 3.15); the rate of increase of Comp C vol. and Comp C level were faster than they would have been in an unthrottled condition (a Comp C level of 30 ft was reached at 71 minutes vice the 88 minutes it took in scenario 1A); the centroid of the flooded water volume was maintained closer to midships than it was in scenario 1A, resulting in less trim on the hull and ultimately a lower inlet pressure at the hull hole.

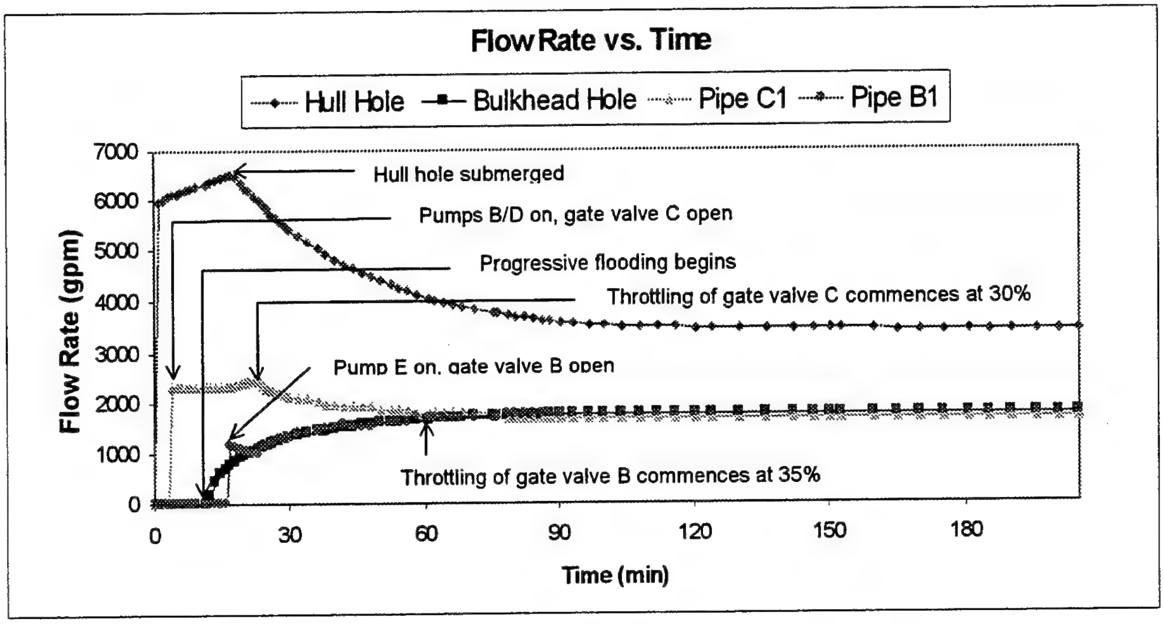

Figure 3.16 Scenario 1B – Flow Rate vs. Time

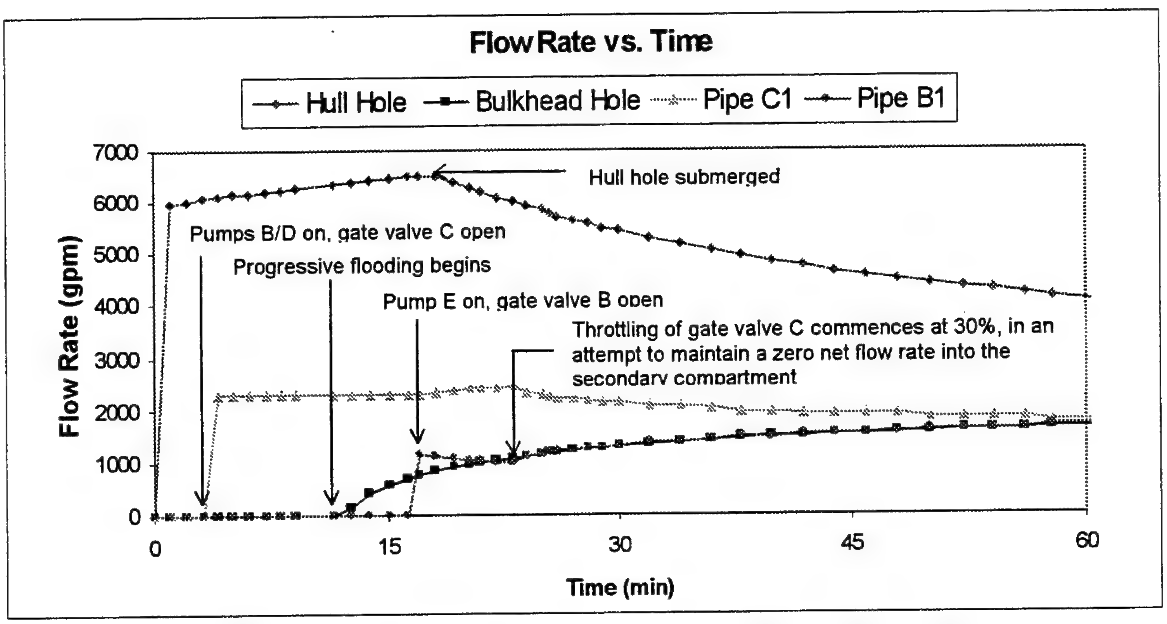

Figure 3.16a Scenario 1B – Flow rate vs. Time (Close up)

As changes in bulkhead flow rate became increasingly smaller (seen as decreasing slope in Figure 3.16), the precision required in the throttling process became greater. This was in direct contrast with the operational characteristics of gate valve C, which

yielded increasingly larger changes in pipe C1 flow rate when throttled below 9% in integer increments. As a result, at 60 minutes, throttling of gate valve B commenced in order to obtain greater precision in equating flow rates. The small fluctuations in Comp B level in Figure 3.14 were caused by the inaccuracies of the throttling method and the restriction of throttling the valves in integer increments. Had net flow into compartment B truly been maintained at zero, the plot of Comp B level would have been a straight line of zero slope.

The simulation was stopped at 205 minutes, at which time the flow rates into and out of the hull were equivalent to 5 significant digits and the draft was constant to six significant digits. The results of this scenario show that damage control procedures can be the determining factor in a ship surviving progressive flooding. Additionally, they show that a surviving ship's equilibrium condition is dependent on the effectiveness of the damage control procedures.

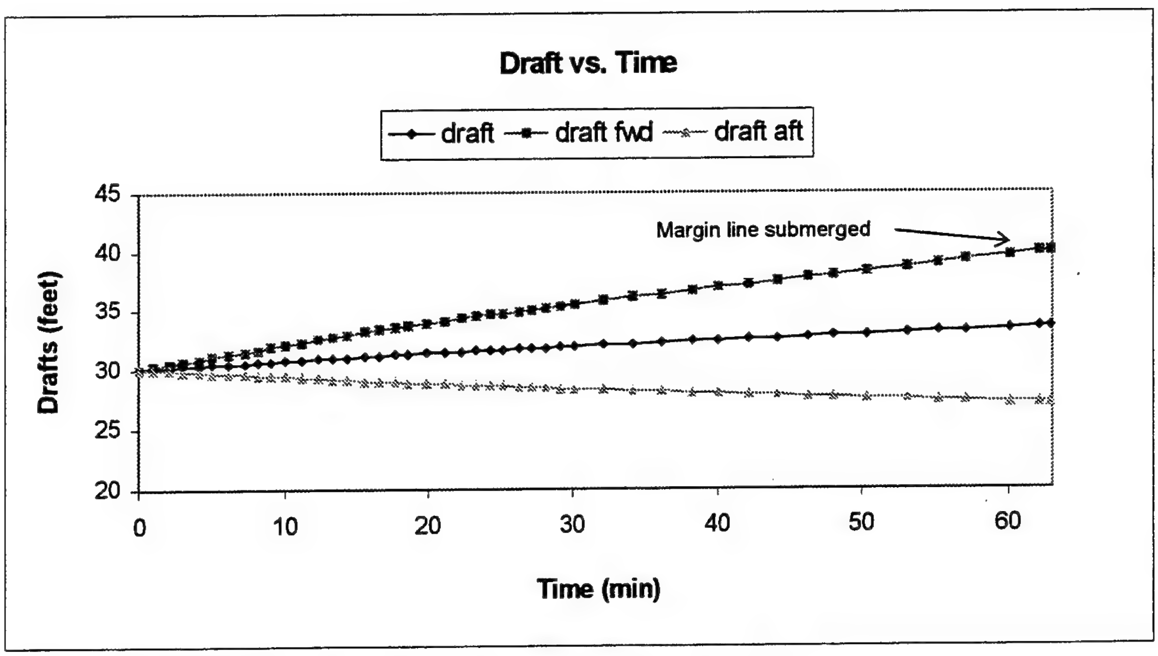

Figure 3.17 Scenario 2 – Draft vs. Time

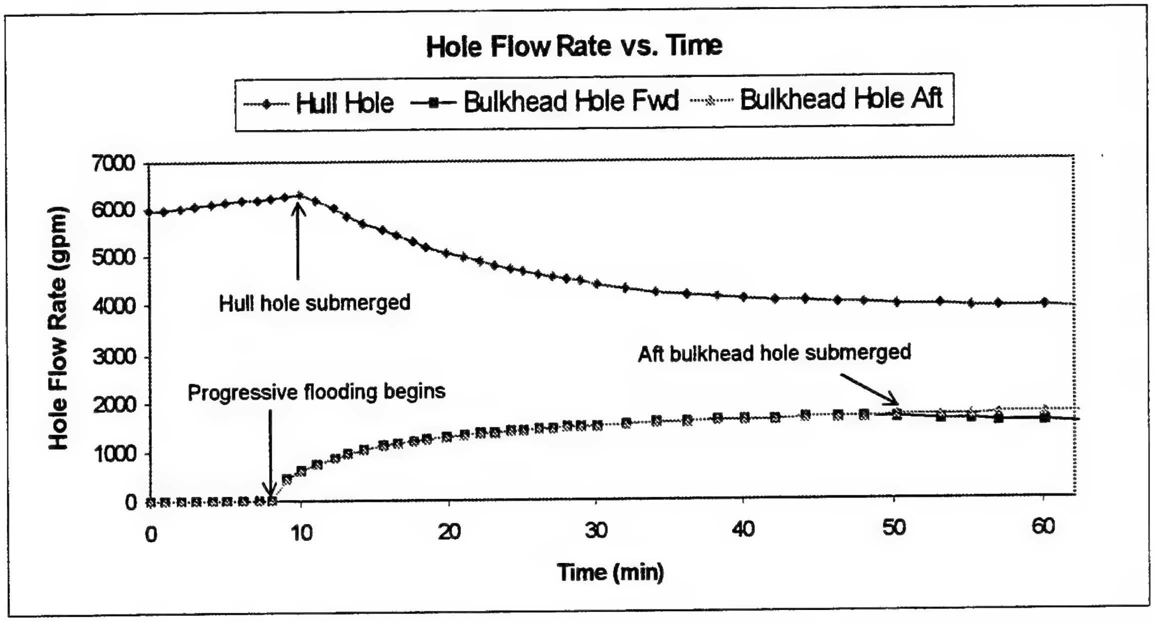

Figure 3.18 Scenario 2 – Flow Rate vs. Time

4. Scenario 2

Scenario 2 (primary flooding of compartment D with progressive flooding of compartments C and E) ran for 61 minutes before the margin line was submerged and the simulation was stopped (Figure 3.17).

As in the previous scenarios, immediately after flooding commenced the hole flow rate began to increase. The tables in Appendix J and Figure 3.18 show however, that its rate of increase was slower than it had been in the earlier scenarios. In scenario 1 the flow rate had increased by 420 gpm after 8 minutes while in this scenario at the same instance it had increased by only 280 gpm. This was due to compartment D lying closer to miships than compartment C (less trim for same flooded volume and shallower depth of hole for same trim).

At 8 minutes progressive flooding began through both the forward and aft bulkheads. Since flooding levels on opposite sides of a compartment can not be equal for

a hull with trim, something is obviously wrong. This scenario highlights a source of error of the program developed in this thesis.

Compartments modeled in SIMSMART are modeled in a fixed reference system. Changes in hole depth are imposed on the hull in the SIMSMART environment by adjusting the static pressure at the input sources, not by the tilting of tanks. Because the compartments modeled in SIMSMART are fixed the program does not account for the effects of trim inside the hull.

At the time that progressive flooding started the trim angle was 0.1544 degrees. Over the 30 ft length of compartment D the trim angle yields a height difference of approximately 1-inch. While this error is almost negligible and in general trim angles are relatively small, at large angles of trim this shortfall of the program could become a significant source of error. It should not, however, significantly affect the results of the work presented here in.

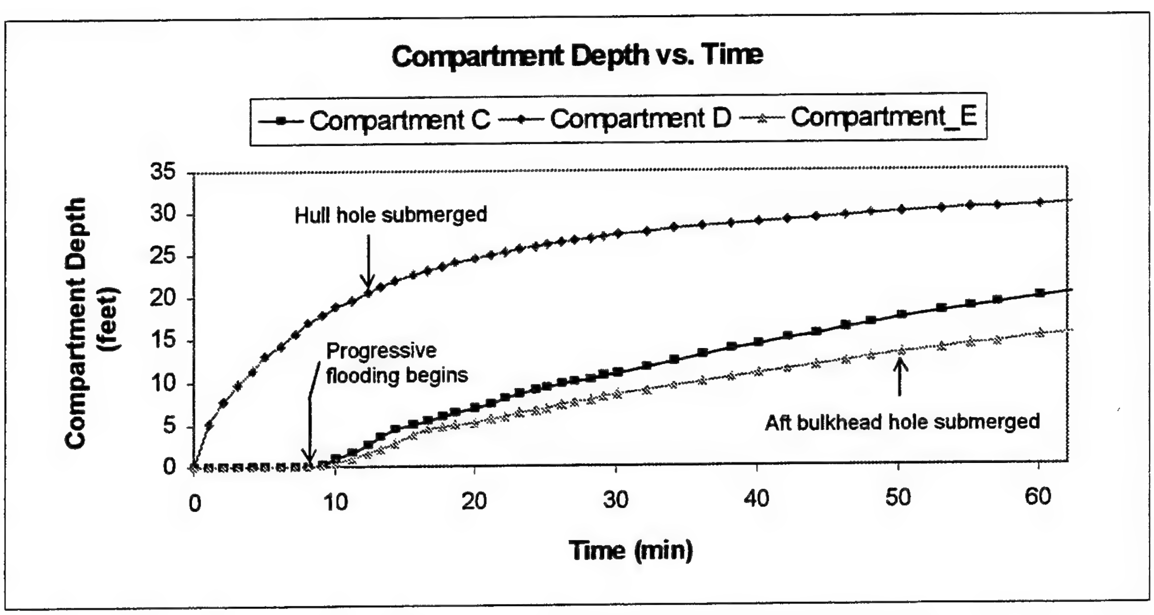

Figure 3.19 Scenario 2 – Compartment Depth vs. Time

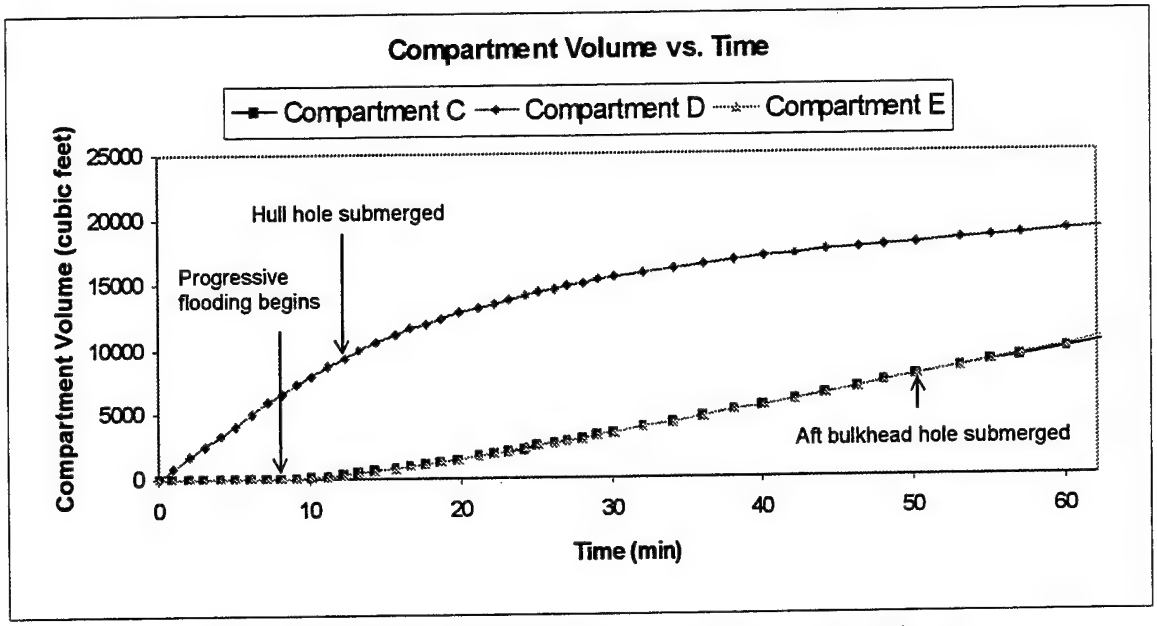

Figure 3.20 Scenario 2 – Compartment Volume vs. Time

Following the start of progressive flooding, Comp C vol. and Comp E vol. remained identical for the reasons stated above. Comp C level and Comp E level however, diverged due to differences in compartment geometry (Figure 3.19). At 49 minutes that difference in geometry leads to the submergence of the forward bulkhead hole and divergence of the compartment volume curves in figure 3.18.

At 61 minutes the margin line was submerged and the simulation stopped. The fact that submergence of the margin line took almost twice as long as it did in scenario 1 gives insight into the effects of hole location not only on floodable length but also on time of evolution.

5. Scenario 3

Scenario 3 (primary flooding of compartment F with progressive flooding of compartments E) ran for 426 minutes before equilibrium was achieved at a maximum forward draft of 38.4 feet (Figure 3.21).

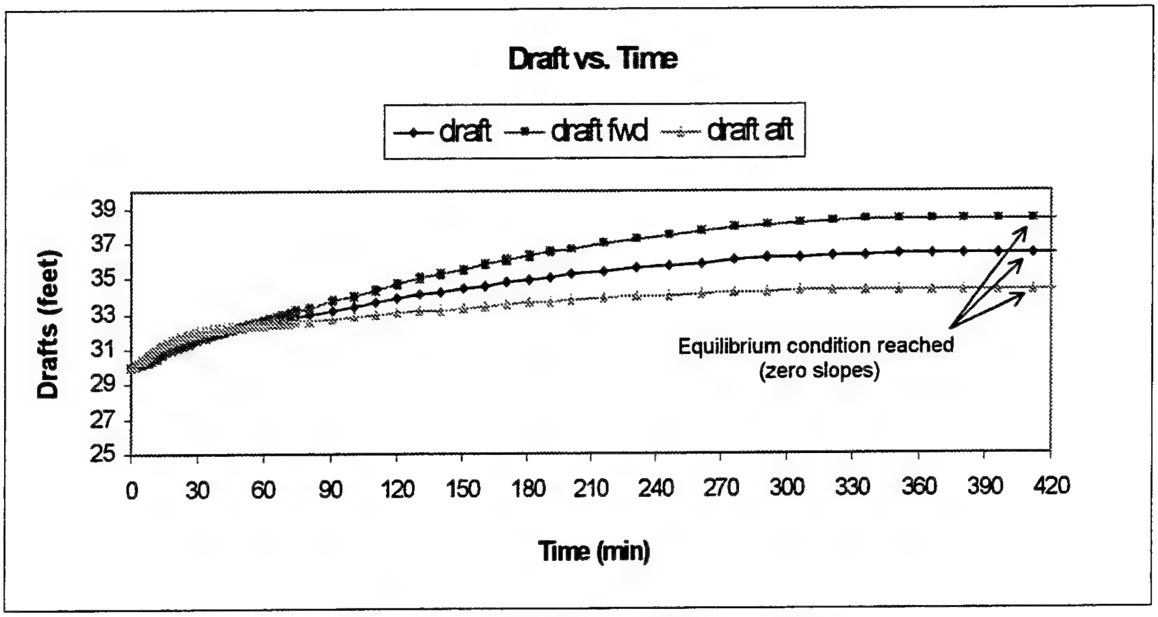

Figure 3.21 Scenario 3 – Draft vs. Time

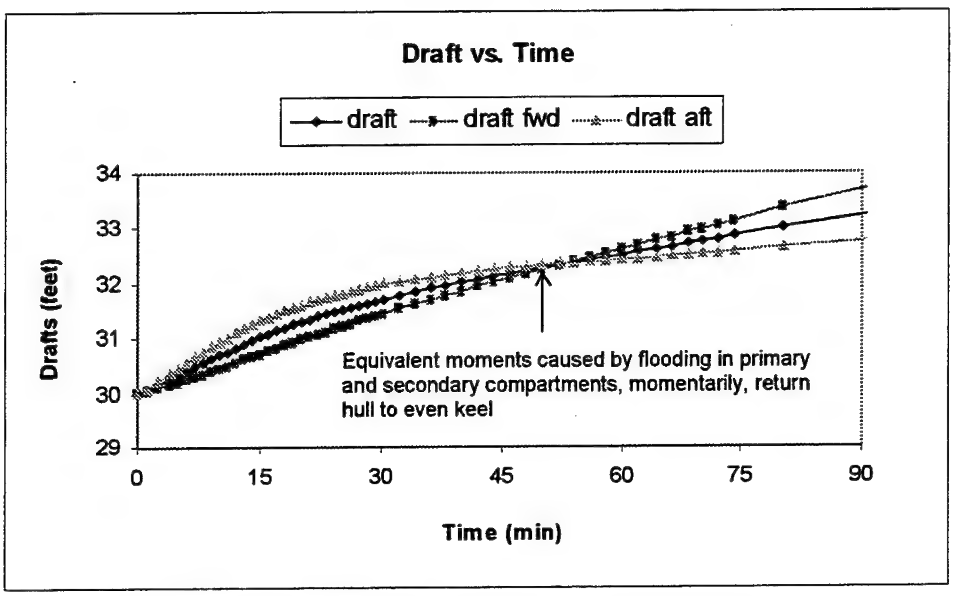

Figure 3.21a Scenario 3 – Draft vs. Time (Close Up)

From the tabularized data in Appendix K and Figures 3.22, 23, 23, & 24 it can be seen that in general the chain of events of leading up to hull hole submergence was similar to that of scenario 1 with one exception. The trim in this scenario was originally by the stern, due to the fact that the bulkhead hole was aft of miships. At 7 ½ minutes

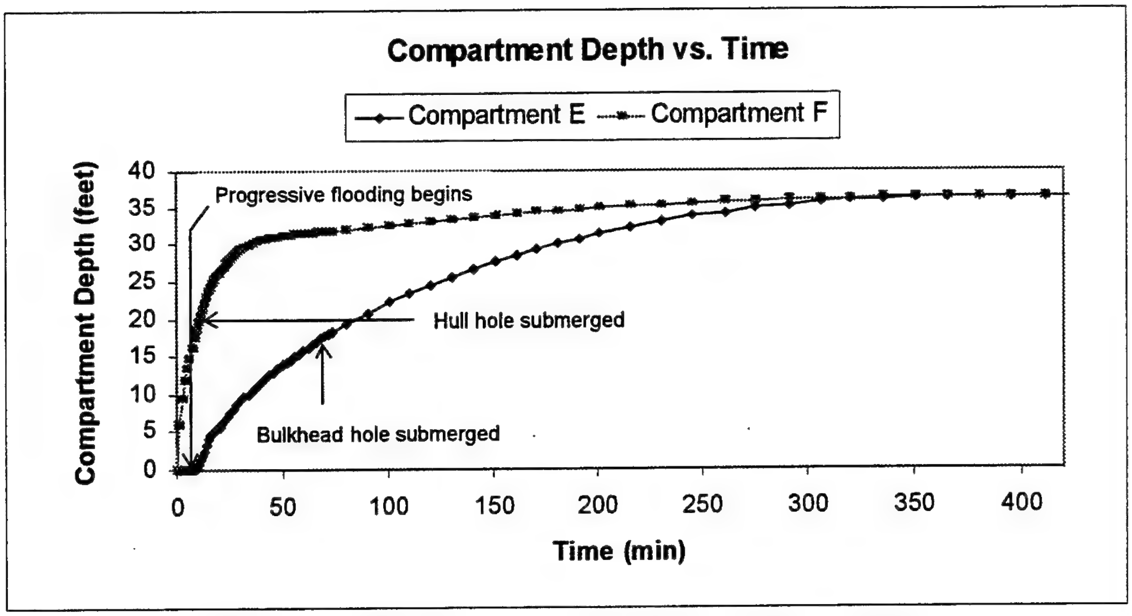

Figure 3.22 Scenario 3 – Compartment Depth vs. Time

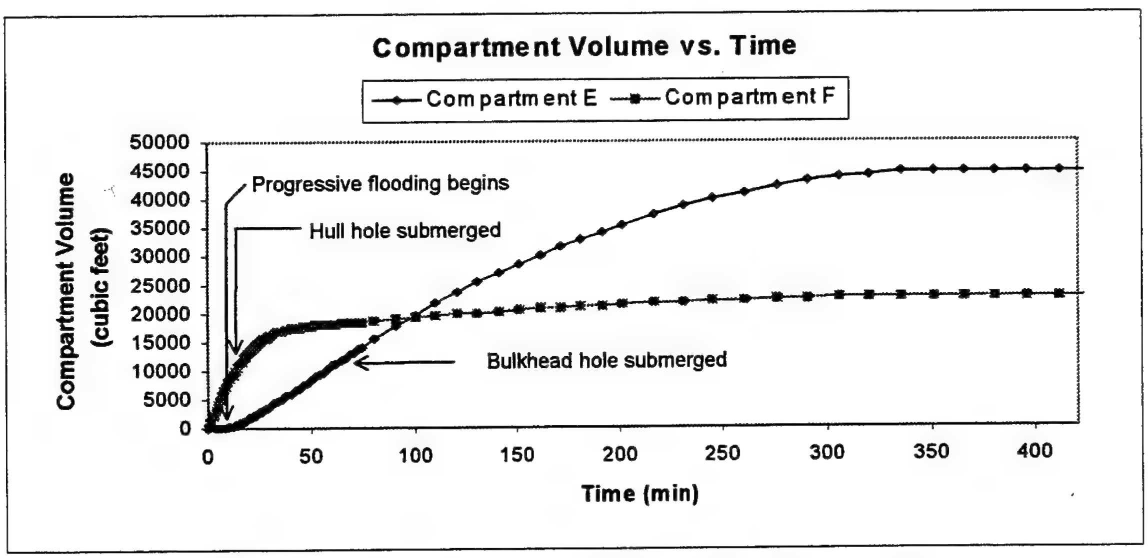

Figure 3.23 Scenario 3 – Compartment Volume vs. Time

progressive flooding began into compartment E which was located forward of miships. As the water level began to increase in compartment E, the rate of increase in trim by the stern began to slow. At approximately 15 minutes the rate of increase in trim by the stern became zero and the hull began to trim in the opposite direction (Figure 3.21a). It is

important to remember that the Wigley hull is symmetric longitudinally about midships and that compartment E is longer than compartment F (50 and 25 ft respectively). At 52 minutes the hull returned to an even keel at a draft of 32.3 ft. This was accomplished by the equality of moments of compartment E (smaller volume, larger moment arm) and compartment F (larger volume, smaller moment arm).

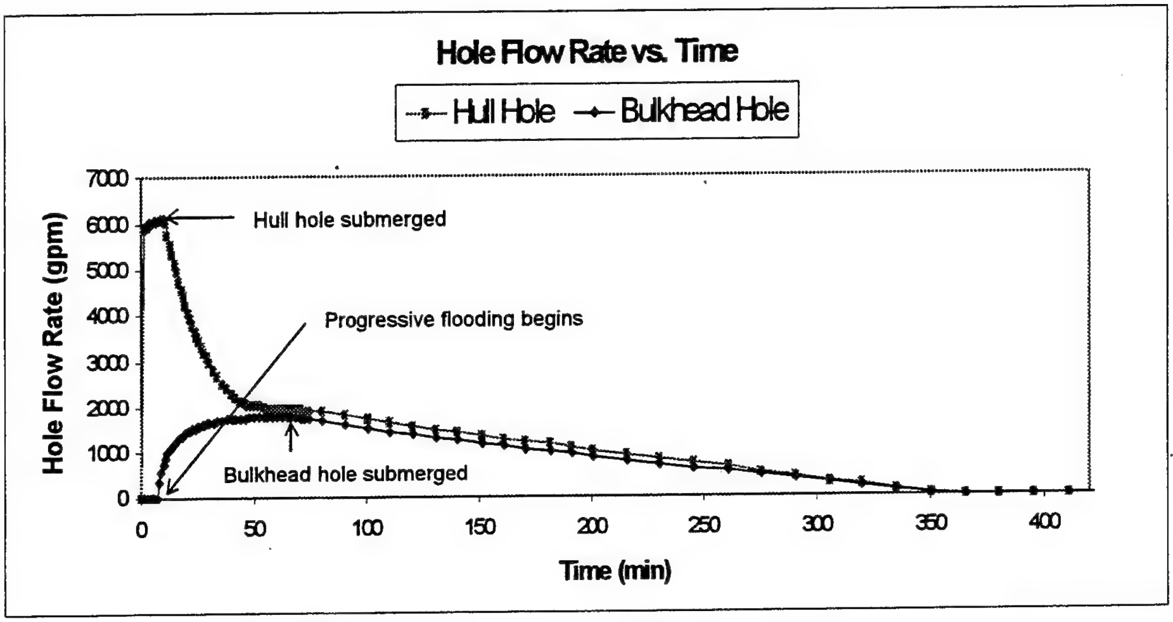

Figure 3.24 Scenario 3 – Flow Rate vs. Time

Figure 3.24 shows the convergence process of hull and bulkhead hole flow rates to zero. After submergence, flow rate through the bulkhead hole decreased. This decrease led to a decrease in the rate of volumetric increase in compartment E, which in turn led to decreases in the rates of increase of both draft and trim. This domino effect continued until the equilibrium condition was achieved at 426 minutes.

The results obtained in this scenario were used in determining system capacities in the following 2 scenarios.

From the data in Appendix K it can be seen that flooding through the hull hole commenced at a rate of approximately 5900 gpm and rose to a maximum of 6121 gpm in

about 10 minutes. Based on these results, scenario 3A uses three 2000gpm pumps and a 12-inch dewatering main to prevent progressive flooding.

The results also show that the max flow rate through the bulkhead hole was 1787 gpm. Using this data as a starting point and conducting several trial runs, scenario 3B uses the initial dewatering system with three increased capacity, 1737gpm pumps to maintain the water level in compartment E at 2 ft.

In either scenario larger pumps could have been used to meet the requirements, but they would have led to pump cycling, precluding the approximation of an equilibrium condition.

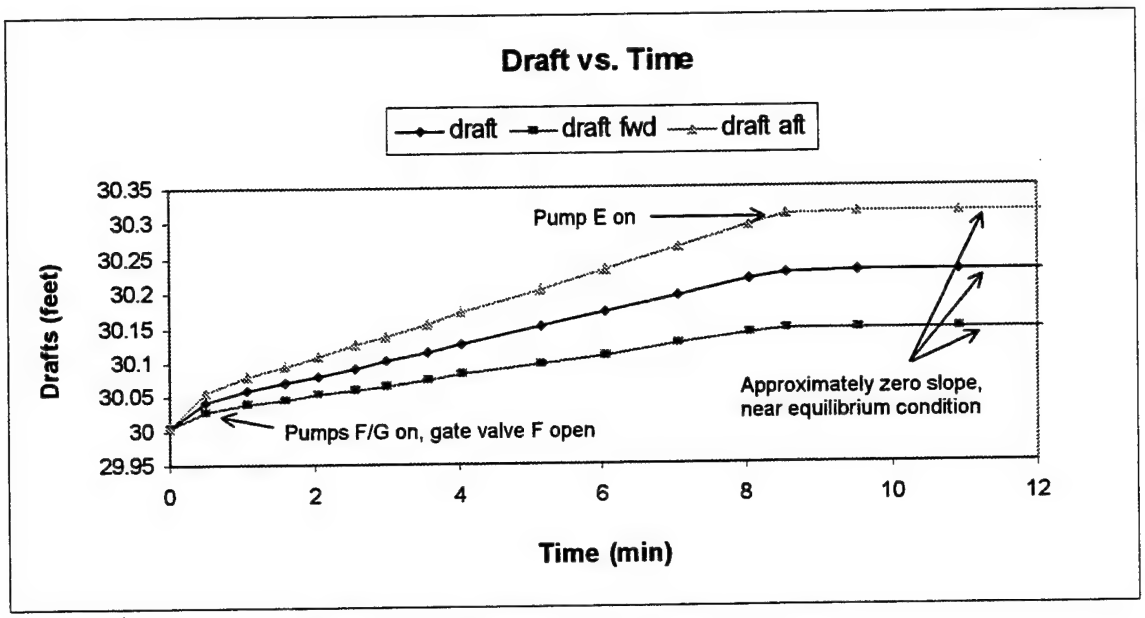

Figure 3.25 Scenario 3A – Draft vs. Time

6. Scenario 3A

Scenario 3A ran for 12 minutes before an approximate equilibrium was achieved at a maximum aft draft of 30.31 feet (Figure 3.25). Approximate equilibrium refers to the fact that, while the draft was constant to six significant digits at the end of the simulation,

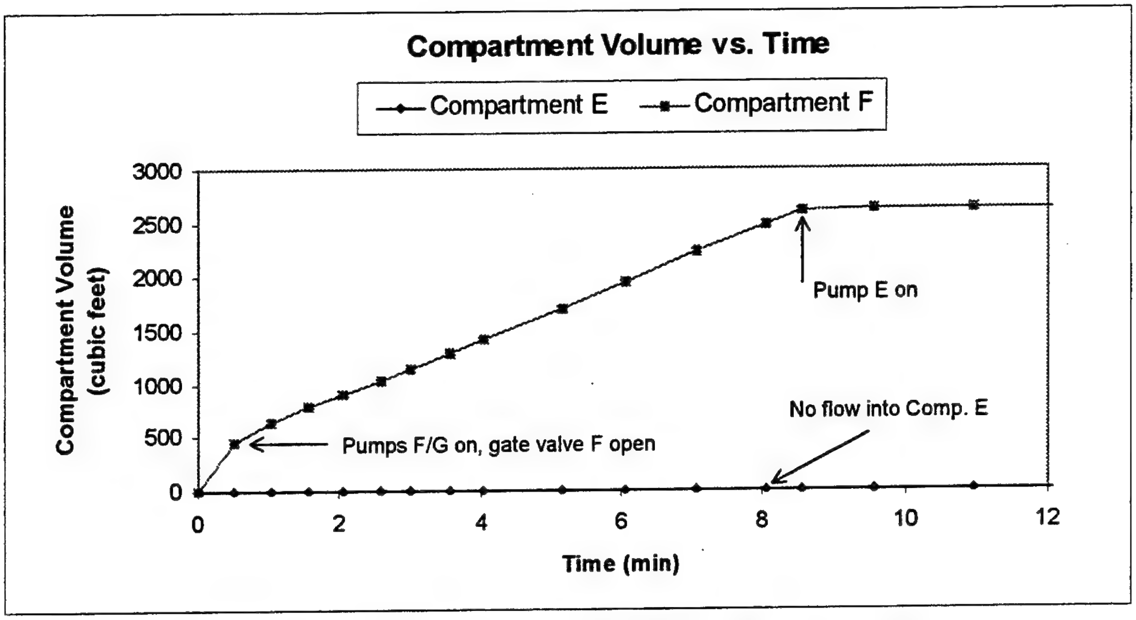

Figure 3.26 Scenario 3A – Compartment Volume vs. Time

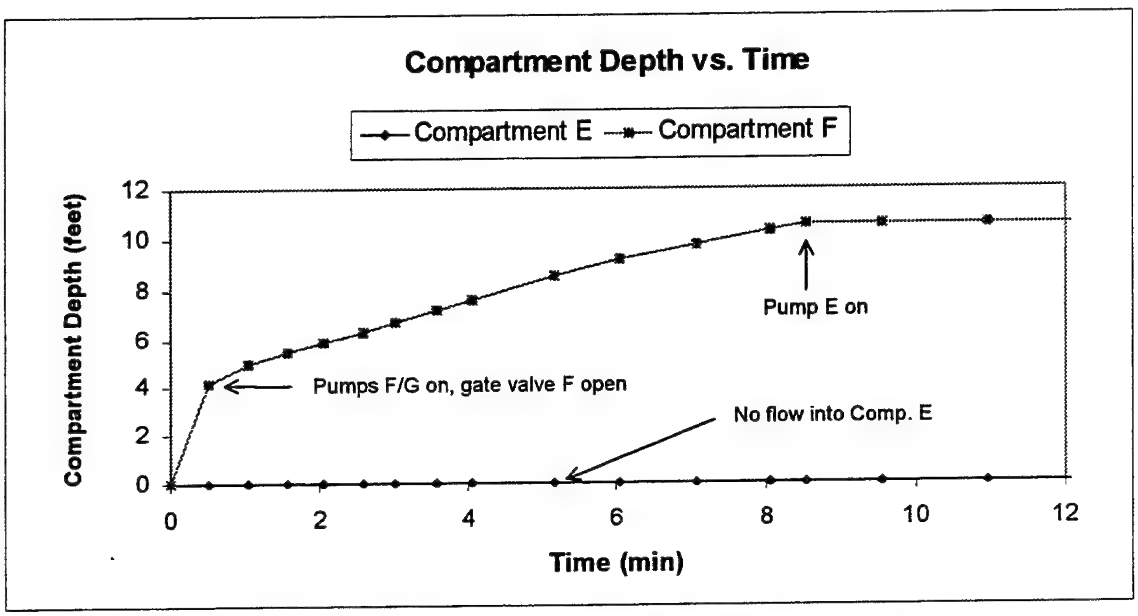

Figure 3.27 Scenario 3A – Compartment Depth vs. Time

the flow rate out of the hull did exceed the in flow rate by 0.47 gpm. This indicates that even though it would take an extremely long time, eventually the compartment would be dewatered.

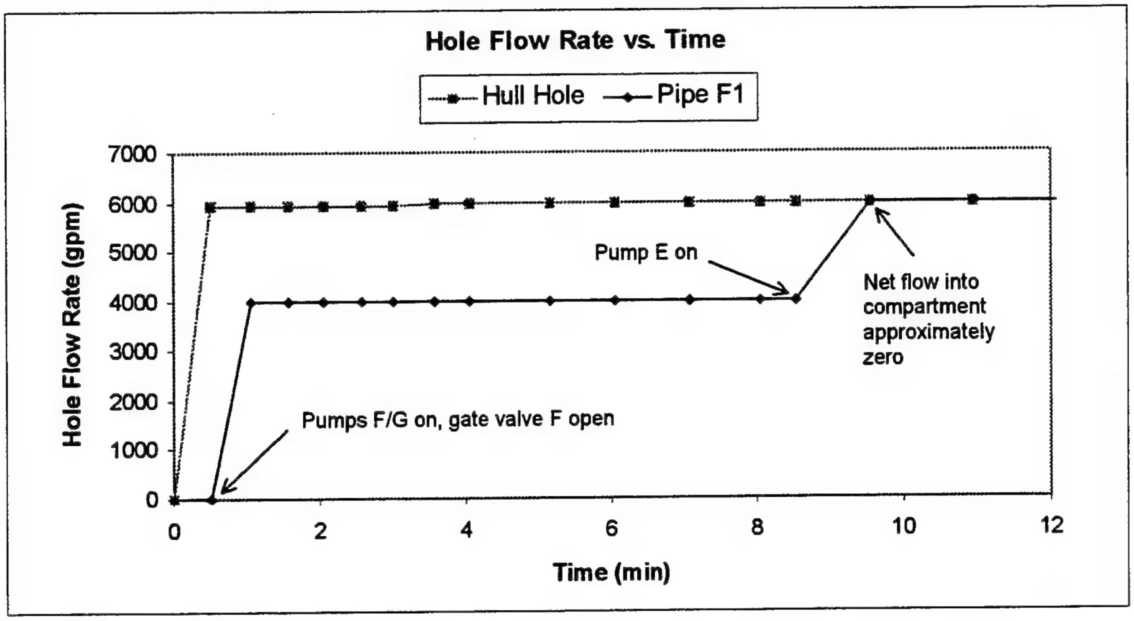

Figure 3.28 Scenario 3A – Flow Rate vs. Time

Almost immediately after starting the simulation, 30 seconds, gate valve F was opened and pumps F and G were turned on (Appendix L). Net flow rate into the compartment dropped to approximately 1950 gpm. As Comp F volume and level increased (Figures 3.26 and 3.27 respectively), so to did the hull hole flow rate.

At 10 minutes, as hull hole flow rate reached 6000 gpm, pump G was turned on effectively matching the hole flow rate. As mentioned above, because the match between pumping rate and hull hole flow rate are not exact, eventually the pump will dewater the space.

7. Scenario 3B

Scenario 3B ran for 102 minutes before equilibrium was achieved at a maximum aft draft of 32.1 feet (Figure 3.29).

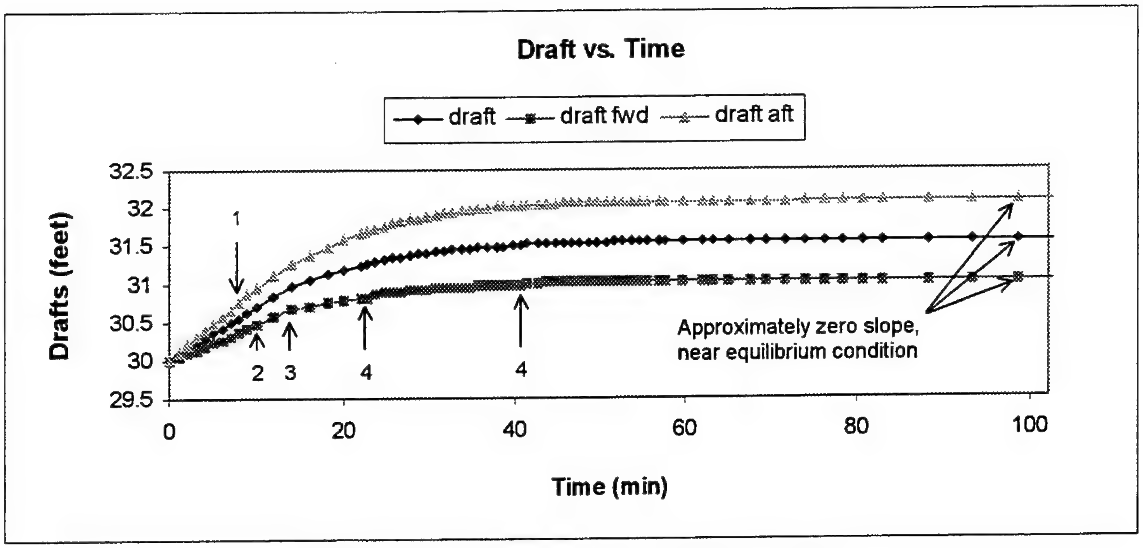

Figure 3.29. Scenario 3B – Draft vs. Time

1 - progressive flooding begins
2 – hull hole submerged on both sides
3 – pump E on, gate valve E open
4 – pump E off and gate valve E closed momentarily

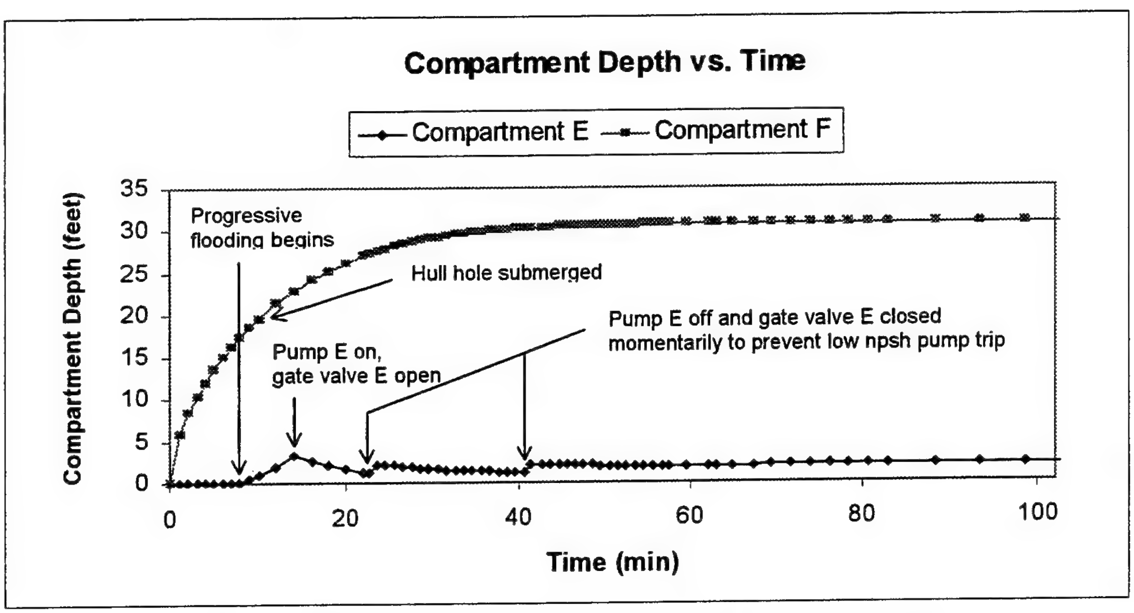

Figure 3.30. Scenario 3B – Compartment Depth vs. Time

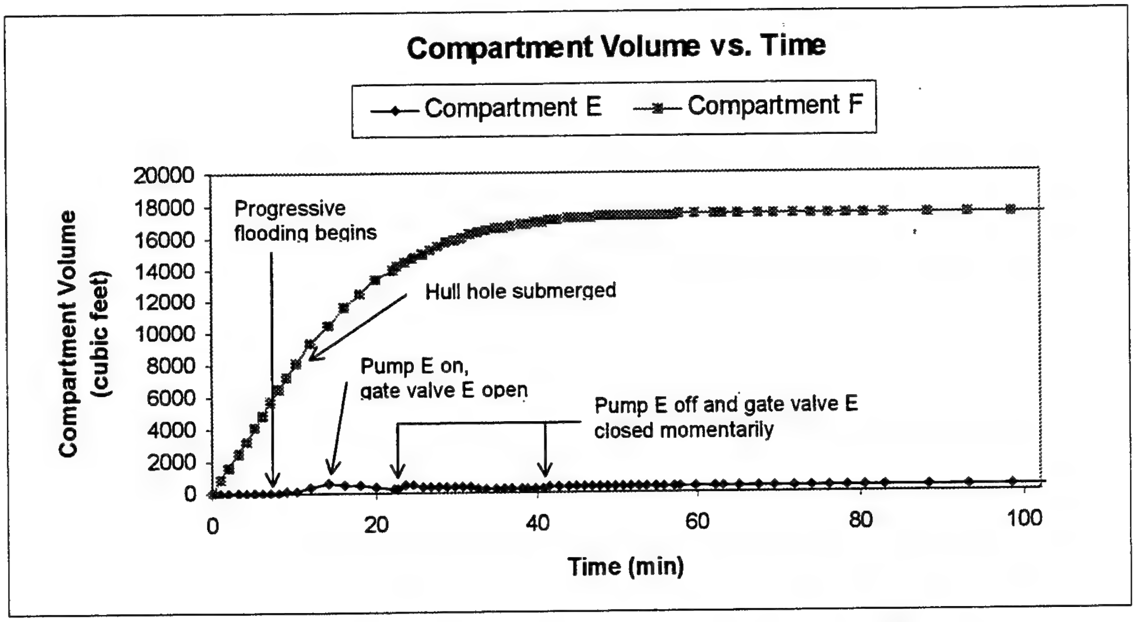

Figure 3.31. Scenario 3B – Compartment Volume vs. Time

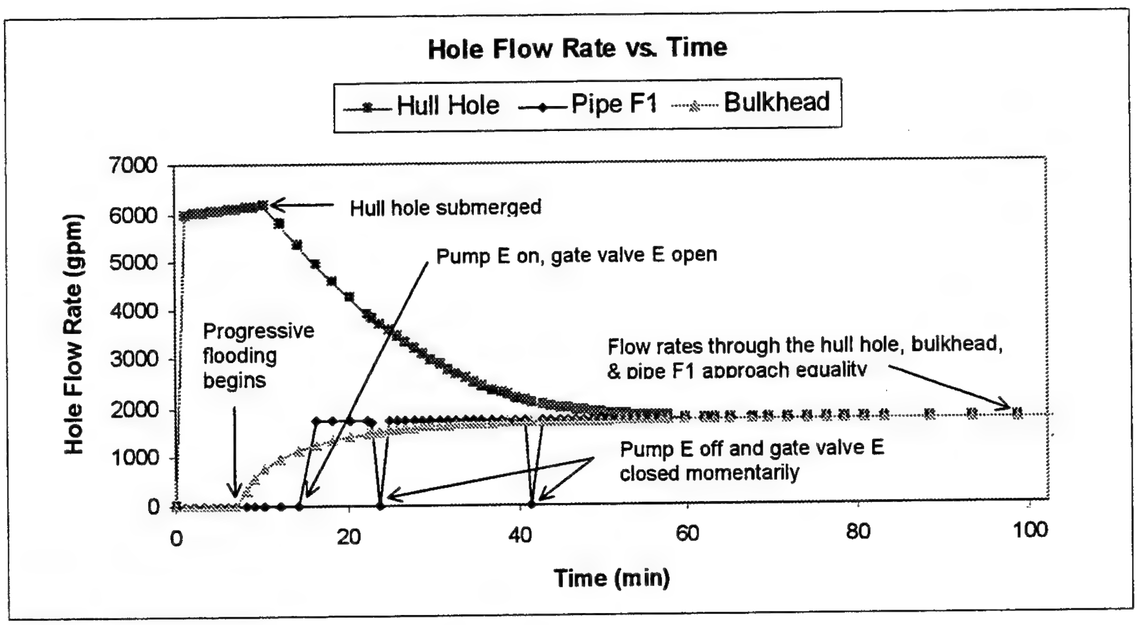

Figure 3.32. Scenario 3B – Flow Rate vs. Time

From the tabularized data in Appendix M and Figures 3.30, 31, & 32 it can be seen that for the first 14 minutes of scenario 3B the results obtained were identical to those of scenario 3. At that time gate valve E was opened and pump E was turned on.

Because the pumping rate was greater than the flow through the bulkhead hole, Comp E level decreased (Figure 3.32). This mismatch in flow rates was to be expected since the pumping capacity was chosen to match both the hull and bulkhead hole flow rates at the equilibrium condition. At 23 minutes pump E was momentarily shut off, allowing a slight rise in Comp E level and preventing the pump from shutting down due to low net positive suction head (npsh). Pump E was shut down again at 40 minutes for the same reason. In figure m.4 it can be see that as time progressed, the three flow rates converged to the designed pumping rate.

The simulation was stopped at 102 minutes, at which time the flow rates into and out of the hull were equivalent to 5 significant digits and the draft was constant to six significant digits.

IV. CONCLUSIONS

This thesis has successfully developed a SIMSMART based, progressive flooding design tool. Through the simulation of several scenarios, the program has proven its ability to accurately model the progressive flooding process. Through scenarios 1, 1A and 1B the utility of the program in evaluating the effectiveness of various damage control procedures was demonstrated. Figure 4.1 shows the results of the three scenarios, which differ only in the damage control procedures utilized.

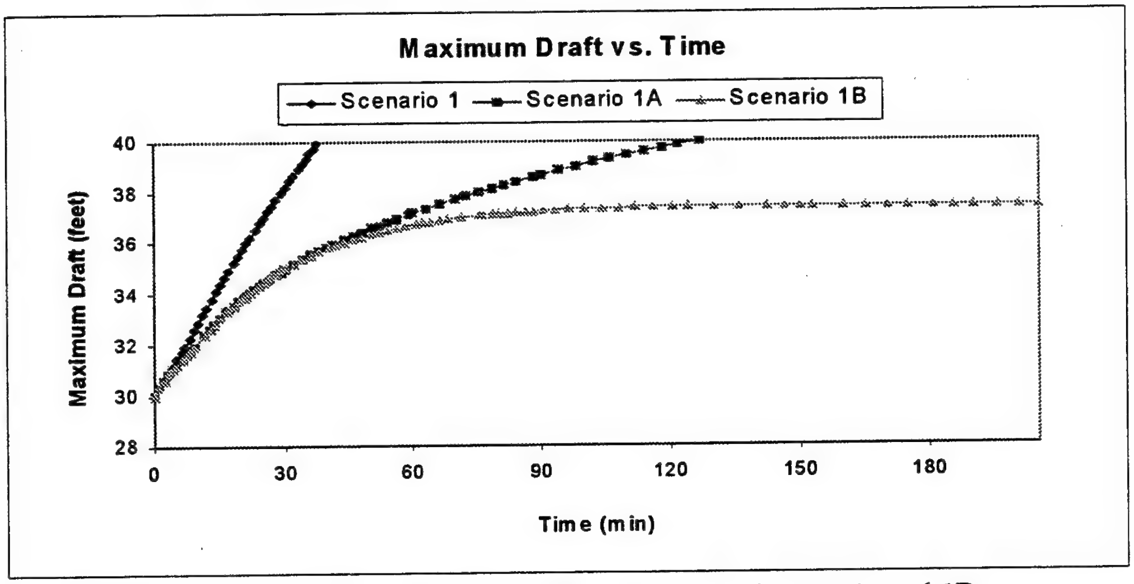

Figure 4.1 Maximum Draft vs. Time for Sceanrios 1, 1A, and 1B

Finally, through scenarios 3, 3A and 3 B the utility of the program in selecting and evaluating damage control systems was demonstrated.

V. RECOMMENDATIONS

The program developed by this thesis was, from the onset, intended to lay the ground work for a more complex and capable simulation tool. The author recommends the following areas be pursued in improving and expanding on the work conducted here in:

1. Automate and synchronize the process of data transfer from Excel to SIMSMART and the data recording procedure.

2. Build a SIMSMART component that models a short tube orifice (hull/bulkhead hole) and develop a means of accounting for the effects of trim internal to the hull.

3. Expand the current model to include longitudinal bulkheads and transverse naval architecture calculations, such as heel and GM.

4. Develop model based on existing ship, including damage control systems, and run simulations utilizing pre-existing tabular naval architecture information.

5. Validate the program by simulating actual damage received by a vessel, in conjunction with modeling its damage control efforts. Compare the results obtained with those documenting the actual event (ex. USS SAMUEL B. ROBERTS).

APPENDIX A. COMPONENTS OF SIMSMART MODEL

ORIFICES

Bulkhead BA,
Scenario 1
Scenario 2 fwd
Scenario 2 aft
Scenario 3
Bulkhead HG
Bulkhead IH
Bulkhead JI
Hull Hole A
Hull Hole B
Hull Hole 1
Hull Hole 2
Hull Hole E
Hull Hole 3
Hull Hole G
Hull Hole H
Hull Hole I
Hull Hole J

PIPES

Bulkhead BA aft,
Bulkhead CB
Bulkhead DC
Bulkhead ED
Bulkhead FE
Bulkhead HG
Bulkhead IH
Bulkhead JI
Hull A
Hull B
Hull C
Hull D
Hull E
Hull F
Hull G
Hull H
Hull I
Hull J

Pipe A1
Pipe B1
Pipe C1
Pipe D1
Pipe E1
Pipe F1
Pipe G1
Pipe H1
Pipe I1
Pipe J1

PIPES

Bulkheads BA fwd
Bulkhead CB
Bulkhead DC
Bulkhead ED
Bulkhead FE
Bulkhead HG
Bulkhead IH
Bulkhead JI

Pipe B2
Pipe D2
Pipe E2
Pipe F2
Pipe G2
Pipe I2
Suction B
Suction D
Suction E

PIPES

Main B
Main BA
Main CB
Main D
Main DC
Main ED
Main F
Main FE
Main G
Main GF
Main H
Main HG
Main IH
Main JI
Suction F
Suction G
Suction I

INPUT SOURCES

Hole Depth A-I
Hole Depth B-i
Hole Depth C-i
Hole Depth D-i
Hole Depth E-i
Hole Depth F-i
Hole Depth G-i
Hole Depth H-i
Hole Depth I-i
Hole Depth J-i

TANKS

Compartment A
Compartment B
Compartment C
Compartment D
Compartment E
Compartment F
Compartment G
Compartment H
Compartment I
Compartment J

CHECK VALVES

CompA chckvlv
CompB chckvlv
CompC chckvlv
CompD chckvlv
CompE chckvlv
CompF chckvlv
CompG chckvlv
CompH chckvlv
CompI chckvlv
CompJ chckvlv
Checkvlv B
Checkvlv D
Checkvlv E
Checkvlv F
Checkvlv G
Checkvlv I

GATE VALVES

CompA gate
CompB gate
CompC gate
CompD gate
CompE gate
CompF gate
CompG gate
CompH gate
CompI gate
CompJ gate

PUMPS

Pump B
Pump D
Pump E
Pump F
Pump G
Pump I

OUTPUT SOURCES

Overbd B-o
Overbd D-o
Overbd E-o
Overbd F-o
Overbd G-o
Overbd I-o

The following are brief descriptions, provided by the SIMSMART program, of each component type used in the model.

INPUT SOURCES

ISS NAME: pi_marine

DESCRIPTION: Marine Process input - Fuel/Water stream

This object represents the starting point of a process fuel/Water stream on a P&ID. It can also be used as a means of receiving a process stream whose source is in another flowsheet.

ORIFICES

ISS NAME: mrn_orif

DESCRIPTION: Marine in-line orifice plate - Water/Fuel handling

PIPES

ISS NAME: mrn_fex

DESCRIPTION: Marine Flexible conection

This model can simulate friction of the pipe wall, and the 45deg or 90deg elbow(s). This model assumes that the fluid flow is turbulent, where the suggest Reynold's number is 1e8.

Moreover, this model can handle also the heat transfer between the pipe with its surrounding (by free convection, or forced convection).

TANKS

ISS NAME: mrn_atank

DESCRIPTION: Atmospheric tank - water handling.

This model is a pressure source in the "pressure driven" network. The user can specify the volume of the tank versus its level, with this feature the user can give any shape to his (her) application. The model simulates also the overflow through the "weir" or simply the overflowing. The user can specify the shape and the height of the "weir".

CHECK VALVES

ISS NAME: mrn_swcval

DESCRIPTION: Marine Swing check valve - water handling

For this valve to be correctly calibrated, the engineer has to enter the equivalent L over D data and lift factor in the corresponding state variables of the tagged valve (IST). This valve model simulates neither incipient cavitation nor choked flow. It is left to the engineer to select a valve or a process configuration to avoid either of these states. Furthermore, it is also assumed that the engineer will enter data taking into account the appropriate correction factors when required (pipe reducer effects, consistency effects (chemical or pulp stock).

GATE VALVES

ISS NAME: mrn_gtval

DESCRIPTION: Manual Gate valve - water handling

The configuration of this valve can be that of any type of common valve, should it be a ball, butterfly, knife or gate valve. To configure the type of valve desired, the engineer must refer to manufacturer specifications for the valve coefficient (Cv value) expressed as a function of the stem position and the valve size. This data is then entered in the corresponding state variables of the tagged valve (IST). This valve model simulates neither incipient cavitation nor choked flow. It is left to the engineer to select a valve or a process configuration to avoid either of these states. Furthermore, it is also assumed that the engineer will multiply the tables' Cv values by the appropriate correction factors when required (pipe reducer effects, consistency effects (chemical or pulp stock).

Reference: DeZurik Control Valve Handbook, Bulletin CVS, Sept. 1975

TEES

ISS NAME: jctD2P1m

DESCRIPTION: junction, 1 input, 1 run output & 1 branch output

```
KRunIn  ----> 0 ----> KRunOut
              |
              |
              v
          KBrnOut
```

K????? represents the total equivalent length coefficient for the specified stream

PUMPS

ISS NAME: screw_pump

DESCRIPTION:

Screw pump, fixed/variable speed, water handling. The operating principle of this pump is such that it isolates the inlet and outlet of the pump. The flowrate is driven by a variation of the volume. From a simulation point of view, this equipment requires flow driven ICONS to produce the flowrate in the section of the pump.

To be able to fix a volumetric flowrate, a pump head is produced by the pump and the volumetric flowrate is limited in the section. The volumetric flowrate is computed from the maximum performance (rate_flow) multiplied by a volumetric efficiency. In applications the screw pump ICON must be between two nodes. By this configuration the pump is the only ICON in its section and the pressure produce by the forced flow in the node ICONS represent's the inlet and outlet pressure of the pump.

OUTPUT SOURCES

ISS NAME: po_marine

DESCRIPTION: Marine Process output - Fuel/Water stream

This object represents the end point of a process fuel/Waterstream on a P&ID. It can also be used as a means of transporting a process stream to another flowsheet.

APPENDIX B. SIMSMART MODEL SPECIFIC PARAMETERS

The following is a list of all nonzero component parameters at the start of the scenario 1. The rule (r) and state (s) varibles listed below, with the exception of pump status, valve position, and hole clogging (mlf_clg) are the same for all scenarios. Values are provided in metric units.

SSP engine : hullfull

Bulkhead_BA r from_out = 1
Bulkhead_BA s h_in = 4.978298
Bulkhead_BA s h_out = 4.978298
Bulkhead_BA s d_in = 406.400818
Bulkhead_BA s d_out = 406.400818
Bulkhead_BA s d_orif = 152.400299
Bulkhead_BA s beta = 0.375000
Bulkhead_BA s a_o = 0.018242
Bulkhead_BA s a_in = 0.129718
Bulkhead_BA s a_out = 0.129718
Bulkhead_BA s mean_a_o = 0.129718
Bulkhead_BA s d_c = 0.608469
Bulkhead_BA s k_f = 115.055374
Bulkhead_BA s spd_limit = 50.000000
Bulkhead_BA spi0 p_s = 101.324997
Bulkhead_BA spi0 h = 70.000000
Bulkhead_BA spi0 v = 0.001000
Bulkhead_BA spi0 av_visc = 0.001000
Bulkhead_BA spi0 water = 100.000000
Bulkhead_BA spo0 p_s = 101.324997
Bulkhead_BA spo0 h = 70.000000
Bulkhead_BA spo0 v = 0.001000
Bulkhead_BA spo0 av_visc = 0.001000
Bulkhead_BA spo0 water = 100.000000
Bulkhead_BAaft r from_out = 1
Bulkhead_BAaft r mlf_clg = 100
Bulkhead_BAaft s h_in = 4.978298
Bulkhead_BAaft s h_out = 4.978298
Bulkhead_BAaft s d_in = 406.400818
Bulkhead_BAaft s d_out = 406.400818
Bulkhead_BAaft s l_p = 0.008534
Bulkhead_BAaft s a_in = 0.129718
Bulkhead_BAaft s a_out = 0.129718
Bulkhead_BAaft s m_pipe = 1.107065
Bulkhead_BAaft s k_f =
999999986991104.000000
Bulkhead_BAaft s k_pipe = 0.013440
Bulkhead_BAaft s friction = 0.640000
Bulkhead_BAaft s Re = 100.000000
Bulkhead_BAaft s epsilon = 0.001500
Bulkhead_BAaft spi0 p_s = 101.324997
Bulkhead_BAaft spi0 h = 70.000000
Bulkhead_BAaft spi0 v = 0.001000
Bulkhead_BAaft spi0 av_visc = 0.001000
Bulkhead_BAaft spi0 water = 100.000000
Bulkhead_BAaft spo0 p_s = 101.324997
Bulkhead_BAaft spo0 h = 70.000000
Bulkhead_BAaft spo0 v = 0.001000
Bulkhead_BAaft spo0 av_visc = 0.001000
Bulkhead_BAaft spo0 water = 100.000000
Bulkhead_BAfwd r from_out = 1
Bulkhead_BAfwd s h_in = 4.978298
Bulkhead_BAfwd s h_out = 4.978298
Bulkhead_BAfwd s d_in = 406.400818
Bulkhead_BAfwd s d_out = 406.400818
Bulkhead_BAfwd s l_p = 0.008534
Bulkhead_BAfwd s a_in = 0.129718
Bulkhead_BAfwd s a_out = 0.129718
Bulkhead_BAfwd s m_pipe = 1.107065
Bulkhead_BAfwd s k_pipe = 0.013440
Bulkhead_BAfwd s friction = 0.640000
Bulkhead_BAfwd s Re = 100.000000
Bulkhead_BAfwd s epsilon = 0.001500
Bulkhead_BAfwd spi0 p_s = 101.324997
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Bulkhead_BAfwd spi0 v = 0.001000
Bulkhead_BAfwd spi0 av_visc = 0.001000
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Bulkhead_BAfwd spo0 av_visc = 0.001000
Bulkhead_BAfwd spo0 water = 100.000000
Bulkhead_BAfwd sr order = 1
Bulkhead_BAfwd sr clg_flag = 2
Bulkhead_BAfwd sr clg_by_mlf = 1
Bulkhead_BAfwd sr pump_loc = -1
Bulkhead_BAfwd sr type_eq = 0
Bulkhead_BAfwd ss hi_sct = 4.978298
Bulkhead_BAfwd ss ho_sct = 4.978298
Bulkhead_BAfwd ss ai_sct = 0.129718
Bulkhead_BAfwd ss ao_sct = 0.129718
Bulkhead_BAfwd ss v_sct = 0.001000
Bulkhead_BAfwd ss ad_max = 1.000000
Bulkhead_BAfwd ss sum_k =
999999986991104.000000
Bulkhead_BAfwd ss sum_k_a2 =
999999986991104.000000
Bulkhead_BAfwd ss l_sct = 0.017069
Bulkhead_BAfwd ss mu = 0.001000
Bulkhead_BAfwd ssp w_max = 100000.000000
Bulkhead_BCaft s h_in = 4.978298

Bulkhead_BCaft s h_out = 4.978298
Bulkhead_BCaft s d_in = 406.400818
Bulkhead_BCaft s d_out = 406.400818
Bulkhead_BCaft s l_p = 0.008534
Bulkhead_BCaft s a_in = 0.129718
Bulkhead_BCaft s a_out = 0.129718
Bulkhead_BCaft s m_pipe = 1.107065
Bulkhead_BCaft s k_pipe = 0.000366
Bulkhead_BCaft s friction = 0.017440
Bulkhead_BCaft s Re = 113349.148438
Bulkhead_BCaft s epsilon = 0.001500
Bulkhead_BCaft spi0 p_s = 101.324997
Bulkhead_BCaft spi0 h = 70.027069
Bulkhead_BCaft spi0 v = 0.001000
Bulkhead_BCaft spi0 av_visc = 0.001000
Bulkhead_BCaft spi0 water = 99.999977
Bulkhead_BCaft spo0 p_s = 101.324997
Bulkhead_BCaft spo0 h = 70.027069
Bulkhead_BCaft spo0 v = 0.001000
Bulkhead_BCaft spo0 av_visc = 0.001000
Bulkhead_BCaft spo0 water = 99.999977
Bulkhead_BCfwd s h_in = 4.978298
Bulkhead_BCfwd s h_out = 4.978298
Bulkhead_BCfwd s d_in = 406.400818
Bulkhead_BCfwd s d_out = 406.400818
Bulkhead_BCfwd s l_p = 0.008534
Bulkhead_BCfwd s a_in = 0.129718
Bulkhead_BCfwd s a_out = 0.129718
Bulkhead_BCfwd s m_pipe = 1.107065
Bulkhead_BCfwd s k_pipe = 0.000366
Bulkhead_BCfwd s friction = 0.017440
Bulkhead_BCfwd s Re = 113349.148438
Bulkhead_BCfwd s epsilon = 0.001500
Bulkhead_BCfwd spi0 p_s = 101.324997
Bulkhead_BCfwd spi0 h = 70.027069
Bulkhead_BCfwd spi0 v = 0.001000
Bulkhead_BCfwd spi0 av_visc = 0.001000
Bulkhead_BCfwd spi0 water = 99.999977
Bulkhead_BCfwd spo0 p_s = 101.324997
Bulkhead_BCfwd spo0 h = 70.027069
Bulkhead_BCfwd spo0 v = 0.001000
Bulkhead_BCfwd spo0 av_visc = 0.001000
Bulkhead_BCfwd spo0 water = 99.999977
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Bulkhead_BCfwd sr clg_flag = -1
Bulkhead_BCfwd sr pump_loc = -1
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Bulkhead_BCfwd ss ao_sct = 0.129718
Bulkhead_BCfwd ss v_sct = 0.001000
Bulkhead_BCfwd ss ad_max = 1.000000
Bulkhead_BCfwd ss sum_k = 115.056107
Bulkhead_BCfwd ss sum_k_a2 = 6837.692383
Bulkhead_BCfwd ss l_sct = 0.017069
Bulkhead_BCfwd ss mu = 0.001000
Bulkhead_CDaft r mlf_clg = 100
Bulkhead_CDaft s h_in = 4.978298
Bulkhead_CDaft s h_out = 4.978298
Bulkhead_CDaft s d_in = 406.400818
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Bulkhead_CDaft s a_out = 0.129718
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Bulkhead_CDaft s Re = 113349.148438
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Bulkhead_CDaft spi0 v = 0.001000
Bulkhead_CDaft spi0 av_visc = 0.001000
Bulkhead_CDaft spi0 water = 99.999977
Bulkhead_CDaft spo0 p_s = 101.324997
Bulkhead_CDaft spo0 h = 70.027069
Bulkhead_CDaft spo0 v = 0.001000
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Bulkhead_CDfwd s epsilon = 0.001500
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Bulkhead_CDfwd spo0 av_visc = 0.001000
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Bulkhead_CDfwd sr pump_loc = -1
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Bulkhead_CDfwd ss ho_sct = 4.978298
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Bulkhead_CDfwd ss sum_k_a2 = 6837.692383
Bulkhead_CDfwd ss l_sct = 0.017069
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Bulkhead_EDaft r mlf_clg = 100
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Bulkhead_EDaft s h_out = 4.978298
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Bulkhead_EDaft s d_out = 406.400818
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Bulkhead_EDaft s a_out = 0.129718
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Bulkhead_EDaft s k_pipe = 0.013440
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Bulkhead_EDaft s Re = 100.000000
Bulkhead_EDaft s epsilon = 0.001500
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Bulkhead_EDaft spi0 h = 70.000000
Bulkhead_EDaft spi0 v = 0.001000
Bulkhead_EDaft spi0 av_visc = 0.001000
Bulkhead_EDaft spi0 water = 100.000000
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Bulkhead_EDaft spo0 h = 70.000000
Bulkhead_EDaft spo0 v = 0.001000
Bulkhead_EDaft spo0 av_visc = 0.001000
Bulkhead_EDaft spo0 water = 100.000000
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Bulkhead_EDfwd s h_out = 4.978298
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Bulkhead_EDfwd s d_out = 406.400818
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Bulkhead_EDfwd s a_in = 0.129718
Bulkhead_EDfwd s a_out = 0.129718
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Bulkhead_EDfwd s k_pipe = 0.013440
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Bulkhead_EDfwd s Re = 100.000000
Bulkhead_EDfwd s epsilon = 0.001500
Bulkhead_EDfwd spi0 p_s = 101.324997
Bulkhead_EDfwd spi0 h = 70.000000
Bulkhead_EDfwd spi0 v = 0.001000
Bulkhead_EDfwd spi0 av_visc = 0.001000
Bulkhead_EDfwd spi0 water = 100.000000
Bulkhead_EDfwd spo0 p_s = 101.324997
Bulkhead_EDfwd spo0 h = 70.000000
Bulkhead_EDfwd spo0 v = 0.001000
Bulkhead_EDfwd spo0 av_visc = 0.001000
Bulkhead_EDfwd spo0 water = 100.000000
Bulkhead_EDfwd sr order = 1
Bulkhead_EDfwd sr clg_flag = 2
Bulkhead_EDfwd sr clg_by_mlf = 1
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Bulkhead_EDfwd ss hi_sct = 4.978298
Bulkhead_EDfwd ss ho_sct = 4.978298
Bulkhead_EDfwd ss ai_sct = 0.129718
Bulkhead_EDfwd ss ao_sct = 0.129718
Bulkhead_EDfwd ss v_sct = 0.001000
Bulkhead_EDfwd ss ad_max = 1.000000
Bulkhead_EDfwd ss sum_k =
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Bulkhead_EDfwd ss sum_k_a2 =
999999986991104.000000
Bulkhead_EDfwd ss l_sct = 0.017069
Bulkhead_EDfwd ss mu = 0.001000
Bulkhead_EDfwd ssp w_max = 100000.000000
Bulkhead_FEaft r from_out = 1
Bulkhead_FEaft r mlf_clg = 100
Bulkhead_FEaft s h_in = 4.978298
Bulkhead_FEaft s h_out = 4.978298
Bulkhead_FEaft s d_in = 406.400818
Bulkhead_FEaft s d_out = 406.400818
Bulkhead_FEaft s l_p = 0.008534
Bulkhead_FEaft s a_in = 0.129718
Bulkhead_FEaft s a_out = 0.129718
Bulkhead_FEaft s m_pipe = 1.107065
Bulkhead_FEaft s k_f =
999999986991104.000000
Bulkhead_FEaft s k_pipe = 0.013440
Bulkhead_FEaft s friction = 0.640000
Bulkhead_FEaft s Re = 100.000000
Bulkhead_FEaft s epsilon = 0.001500
Bulkhead_FEaft spi0 p_s = 101.324997
Bulkhead_FEaft spi0 h = 70.000000
Bulkhead_FEaft spi0 v = 0.001000
Bulkhead_FEaft spi0 av_visc = 0.001000
Bulkhead_FEaft spi0 water = 100.000000
Bulkhead_FEaft spo0 p_s = 101.324997
Bulkhead_FEaft spo0 h = 70.000000
Bulkhead_FEaft spo0 v = 0.001000
Bulkhead_FEaft spo0 av_visc = 0.001000
Bulkhead_FEaft spo0 water = 100.000000
Bulkhead_FEfwd r from_out = 1
Bulkhead_FEfwd s h_in = 4.978298
Bulkhead_FEfwd s h_out = 4.978298
Bulkhead_FEfwd s d_in = 406.400818
Bulkhead_FEfwd s d_out = 406.400818
Bulkhead_FEfwd s l_p = 0.008534
Bulkhead_FEfwd s a_in = 0.129718
Bulkhead_FEfwd s a_out = 0.129718
Bulkhead_FEfwd s m_pipe = 1.107065
Bulkhead_FEfwd s k_pipe = 0.013440
Bulkhead_FEfwd s friction = 0.640000
Bulkhead_FEfwd s Re = 100.000000
Bulkhead_FEfwd s epsilon = 0.001500
Bulkhead_FEfwd spi0 p_s = 101.324997
Bulkhead_FEfwd spi0 h = 70.000000
Bulkhead_FEfwd spi0 v = 0.001000
Bulkhead_FEfwd spi0 av_visc = 0.001000
Bulkhead_FEfwd spi0 water = 100.000000

Bulkhead_FEfwd spo0 p_s = 101.324997
Bulkhead_FEfwd spo0 h = 70.000000
Bulkhead_FEfwd spo0 v = 0.001000
Bulkhead_FEfwd spo0 av_visc = 0.001000
Bulkhead_FEfwd spo0 water = 100.000000
Bulkhead_FEfwd sr order = 1
Bulkhead_FEfwd sr clg_flag = 2
Bulkhead_FEfwd sr clg_by_mlf = 1
Bulkhead_FEfwd sr pump_loc = -1
Bulkhead_FEfwd sr type_eq = 0
Bulkhead_FEfwd ss hi_sct = 4.978298
Bulkhead_FEfwd ss ho_sct = 4.978298
Bulkhead_FEfwd ss ai_sct = 0.129718
Bulkhead_FEfwd ss ao_sct = 0.129718
Bulkhead_FEfwd ss v_sct = 0.001000
Bulkhead_FEfwd ss ad_max = 1.000000
Bulkhead_FEfwd ss sum_k =
999999986991104.000000
Bulkhead_FEfwd ss sum_k_a2 =
999999986991104.000000
Bulkhead_FEfwd ss l_sct = 0.017069
Bulkhead_FEfwd ss mu = 0.001000
Bulkhead_FEfwd ssp w_max = 100000.000000
Bulkhead_GF r from_out = 1
Bulkhead_GF s h_in = 4.978298
Bulkhead_GF s h_out = 4.978298
Bulkhead_GF s d_in = 406.400818
Bulkhead_GF s d_out = 406.400818
Bulkhead_GF s d_orif = 152.400299
Bulkhead_GF s beta = 0.375000
Bulkhead_GF s a_o = 0.018242
Bulkhead_GF s a_in = 0.129718
Bulkhead_GF s a_out = 0.129718
Bulkhead_GF s mean_a_o = 0.129718
Bulkhead_GF s d_c = 0.608469
Bulkhead_GF s k_f = 115.055374
Bulkhead_GF s spd_limit = 50.000000
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Bulkhead_GF spi0 p_s = 101.324997
Bulkhead_GF spi0 h = 70.000000
Bulkhead_GF spi0 v = 0.001000
Bulkhead_GF spi0 av_visc = 0.001000
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Bulkhead_GF spo0 p_s = 101.324997
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Bulkhead_GF spo0 v = 0.001000
Bulkhead_GF spo0 av_visc = 0.001000
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Bulkhead_GFaft r mlf_clg = 100
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Bulkhead_GFaft s d_in = 406.400818
Bulkhead_GFaft s d_out = 406.400818
Bulkhead_GFaft s l_p = 0.008534
Bulkhead_GFaft s a_in = 0.129718
Bulkhead_GFaft s a_out = 0.129718
Bulkhead_GFaft s m_pipe = 1.107065
Bulkhead_GFaft s k_f =
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Bulkhead_GFaft s k_pipe = 0.013440
Bulkhead_GFaft s friction = 0.640000
Bulkhead_GFaft s Re = 100.000000
Bulkhead_GFaft s epsilon = 0.001500
Bulkhead_GFaft spi0 p_s = 101.324997
Bulkhead_GFaft spi0 h = 70.000000
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Bulkhead_GFfwd sr clg_flag = 2
Bulkhead_GFfwd sr clg_by_mlf = 1
Bulkhead_GFfwd sr pump_loc = -1
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Bulkhead_GFfwd ss ho_sct = 4.978298
Bulkhead_GFfwd ss ai_sct = 0.129718
Bulkhead_GFfwd ss ao_sct = 0.129718
Bulkhead_GFfwd ss v_sct = 0.001000
Bulkhead_GFfwd ss ad_max = 1.000000
Bulkhead_GFfwd ss sum_k =
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Bulkhead_GFfwd ss sum_k_a2 =
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Bulkhead_GFfwd ss l_sct = 0.017069

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Bulkhead_HG s d_out = 406.400818
Bulkhead_HG s d_orif = 152.400299
Bulkhead_HG s beta = 0.375000
Bulkhead_HG s a_o = 0.018242
Bulkhead_HG s a_in = 0.129718
Bulkhead_HG s a_out = 0.129718
Bulkhead_HG s mean_a_o = 0.129718
Bulkhead_HG s d_c = 0.608469
Bulkhead_HG s k_f = 115.055374
Bulkhead_HG s spd_limit = 50.000000
Bulkhead_HG spi0 p_s = 101.324997
Bulkhead_HG spi0 h = 70.000000
Bulkhead_HG spi0 v = 0.001000
Bulkhead_HG spi0 av_visc = 0.001000
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Bulkhead_HGaft s d_out = 406.400818
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Bulkhead_HGaft s Re = 100.000000
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Bulkhead_HGfwd ss ad_max = 1.000000
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Bulkhead_HGfwd ss sum_k_a2 =
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Bulkhead_HGfwd ss l_sct = 0.017069
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Bulkhead_IH s d_out = 406.400818
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Bulkhead_IH s a_in = 0.129718
Bulkhead_IH s a_out = 0.129718
Bulkhead_IH s mean_a_o = 0.129718
Bulkhead_IH s d_c = 0.608469
Bulkhead_IH s k_f = 115.055374
Bulkhead_IH s spd_limit = 50.000000
Bulkhead_IH spi0 p_s = 101.324997
Bulkhead_IH spi0 h = 70.000000
Bulkhead_IH spi0 v = 0.001000
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Bulkhead_IH spo0 v = 0.001000
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Bulkhead_IHaft s d_out = 406.400818
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Bulkhead_JIfwd s h_out = 4.978298
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Checkvlv_B r from_out = 1
Checkvlv_B r index_max = 1
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Checkvlv_B s h_out = 7.620000
Checkvlv_B s d_in = 151.892303
Checkvlv_B s d_out = 151.892303
Checkvlv_B s a_valve = 0.018120
Checkvlv_B s a_in = 0.018120
Checkvlv_B s a_out = 0.018120
Checkvlv_B s q_0 = 0.025199
Checkvlv_B s q_1 = 0.268013
Checkvlv_B s dp_0 = 0.740000
Checkvlv_B s dp_1 = 75.000000
Checkvlv_B s dpmin = 0.740000
Checkvlv_B s dpmax = 75.000000
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Checkvlv_B s itmax = 1.000000
Checkvlv_B s eq_mass = 68.027214
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Checkvlv_B sr pump_loc = -1
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Checkvlv_B ss ai_sct = 0.018120
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Checkvlv_E ss l_sct = 18.288000
Checkvlv_E ss mu = 0.001000
Checkvlv_E ssp cd = 9.939569
Checkvlv_E ssp dp = 16.724440
Checkvlv_F r index_h = 30
Checkvlv_F r from_out = 1
Checkvlv_F r index_max = 1
Checkvlv_F s h_in = 7.620000
Checkvlv_F s h_out = 7.620000
Checkvlv_F s d_in = 151.892303
Checkvlv_F s d_out = 151.892303
Checkvlv_F s a_valve = 0.018120
Checkvlv_F s a_in = 0.018120
Checkvlv_F s a_out = 0.018120
Checkvlv_F s q_0 = 0.025199
Checkvlv_F s q_1 = 0.268013
Checkvlv_F s dp_0 = 0.740000
Checkvlv_F s dp_1 = 75.000000
Checkvlv_F s dpmin = 0.740000
Checkvlv_F s dpmax = 75.000000
Checkvlv_F s debitmin = 0.025199
Checkvlv_F s debitmax = 0.268013
Checkvlv_F s itmax = 1.000000
Checkvlv_F s eq_mass = 68.027214
Checkvlv_F spi0 p_s = 20.569763
Checkvlv_F spi0 h = 70.000000
Checkvlv_F spi0 v = 0.001000
Checkvlv_F spi0 av_visc = 0.001000
Checkvlv_F spi0 water = 100.000000
Checkvlv_F spo0 p_s = 116.296883
Checkvlv_F spo0 h = 70.000000
Checkvlv_F spo0 v = 0.001000
Checkvlv_F spo0 av_visc = 0.001000
Checkvlv_F spo0 water = 100.

Checkvlv_F sr empty2 = 1
Checkvlv_F sr order = 1
Checkvlv_F sr pump_loc = -1
Checkvlv_F ss hi_sct = 0.304800
Checkvlv_F ss ho_sct = 7.620000
Checkvlv_F ss ai_sct = 0.018120
Checkvlv_F ss ao_sct = 0.018120
Checkvlv_F ss v_sct = 0.001000
Checkvlv_F ss sum_p_hd = 496.399994
Checkvlv_F ss ad_max = 1.000000
Checkvlv_F ss sum_k = 97.005440
Checkvlv_F ss sum_k_a2 = 295441.281250
Checkvlv_F ss l_sct = 18.288000
Checkvlv_F ss mu = 0.001000
Checkvlv_F ssp cd = 2.436762
Checkvlv_F ssp dp = 17.631561
Checkvlv_G r index_h = 30
Checkvlv_G r from_out = 1
Checkvlv_G r index_max = 1
Checkvlv_G s h_in = 7.620000
Checkvlv_G s h_out = 7.620000
Checkvlv_G s d_in = 151.892303
Checkvlv_G s d_out = 151.892303
Checkvlv_G s a_valve = 0.018120
Checkvlv_G s a_in = 0.018120
Checkvlv_G s a_out = 0.018120
Checkvlv_G s q_0 = 0.025199
Checkvlv_G s q_1 = 0.268013
Checkvlv_G s dp_0 = 0.740000
Checkvlv_G s dp_1 = 75.000000
Checkvlv_G s dpmin = 0.740000
Checkvlv_G s dpmax = 75.000000
Checkvlv_G s debitmin = 0.025199
Checkvlv_G s debitmax = 0.268013
Checkvlv_G s itmax = 1.000000
Checkvlv_G s eq_mass = 68.027214
Checkvlv_G spi0 p_s = 19.205734
Checkvlv_G spi0 h = 70.000000
Checkvlv_G spi0 v = 0.001000
Checkvlv_G spi0 av_visc = 0.001000
Checkvlv_G spi0 water = 100.000000
Checkvlv_G spo0 p_s = 116.296883
Checkvlv_G spo0 h = 70.000000
Checkvlv_G spo0 v = 0.001000
Checkvlv_G spo0 av_visc = 0.001000
Checkvlv_G spo0 water = 100.000000
Checkvlv_G sr empty2 = 1
Checkvlv_G sr order = 1
Checkvlv_G sr pump_loc = -1
Checkvlv_G ss hi_sct = 0.304800
Checkvlv_G ss ho_sct = 7.620000
Checkvlv_G ss ai_sct = 0.018120
Checkvlv_G ss ao_sct = 0.018120
Checkvlv_G ss v_sct = 0.001000
Checkvlv_G ss sum_p_hd = 496.399994
Checkvlv_G ss ad_max = 1.000000
Checkvlv_G ss sum_k = 97.005440
Checkvlv_G ss sum_k_a2 = 295441.281250
Checkvlv_G ss sumk_down 0
Checkvlv_G ss l_sct = 18.288000
Checkvlv_G ss mu = 0.001000
Checkvlv_G ssp cd = 2.436490
Checkvlv_G ssp dp = 18.455780
Checkvlv_I r index_h = 30
Checkvlv_I r from_out = 1
Checkvlv_I r index_max = 1
Checkvlv_I s h_in = 7.620000
Checkvlv_I s h_out = 7.620000
Checkvlv_I s d_in = 151.892303
Checkvlv_I s d_out = 151.892303
Checkvlv_I s a_valve = 0.018120
Checkvlv_I s a_in = 0.018120
Checkvlv_I s a_out = 0.018120
Checkvlv_I s q_0 = 0.025199
Checkvlv_I s q_1 = 0.268013
Checkvlv_I s dp_0 = 0.740000
Checkvlv_I s dp_1 = 75.000000
Checkvlv_I s dpmin = 0.740000
Checkvlv_I s dpmax = 75.000000
Checkvlv_I s debitmin = 0.025199
Checkvlv_I s debitmax = 0.268013
Checkvlv_I s itmax = 1.000000
Checkvlv_I s eq_mass = 68.027214
Checkvlv_I spi0 p_s = 17.983818
Checkvlv_I spi0 h = 70.000000
Checkvlv_I spi0 v = 0.001000
Checkvlv_I spi0 av_visc = 0.001000
Checkvlv_I spi0 water = 100.000000
Checkvlv_I spo0 p_s = 116.296883
Checkvlv_I spo0 h = 70.000000
Checkvlv_I spo0 v = 0.001000
Checkvlv_I spo0 av_visc = 0.001000
Checkvlv_I spo0 water = 100.000000
Checkvlv_I sr empty2 = 1
Checkvlv_I sr order = 1
Checkvlv_I sr pump_loc = -1
Checkvlv_I ss hi_sct = 0.304800
Checkvlv_I ss ho_sct = 7.620000
Checkvlv_I ss ai_sct = 0.018120
Checkvlv_I ss ao_sct = 0.018120
Checkvlv_I ss v_sct = 0.001000
Checkvlv_I ss sum_p_hd = 496.399994
Checkvlv_I ss ad_max = 1.000000
Checkvlv_I ss sum_k = 97.005440
Checkvlv_I ss sum_k_a2 = 295441.281250
Checkvlv_I ss sumk_down 0
Checkvlv_I ss l_sct = 18.288000
Checkvlv_I ss mu = 0.001000
Checkvlv_I ssp cd = 2.436244
Checkvlv_I ssp dp = 19.220032
CompA_chckvlv r index_h = 30
CompA_chckvlv r index_max = 1

CompA_chckvlv s h_in = 0.304800
CompA_chckvlv s h_out = 0.304800
CompA_chckvlv s d_in = 151.892303
CompA_chckvlv s d_out = 151.892303
CompA_chckvlv s a_valve = 0.018120
CompA_chckvlv s a_in = 0.018120
CompA_chckvlv s a_out = 0.018120
CompA_chckvlv s q_0 = 0.025199
CompA_chckvlv s q_1 = 0.268013
CompA_chckvlv s dp_0 = 0.740000
CompA_chckvlv s dp_1 = 75.000000
CompA_chckvlv s dpmin = 0.740000
CompA_chckvlv s dpmax = 75.000000
CompA_chckvlv s debitmin = 0.025199
CompA_chckvlv s debitmax = 0.268013
CompA_chckvlv s itmax = 1.000000
CompA_chckvlv s eq_mass = 35.380001
CompA_chckvlv spi0 p_s = 101.324997
CompA_chckvlv spi0 h = 70.000000
CompA_chckvlv spi0 v = 0.001000
CompA_chckvlv spi0 av_visc = 0.001000
CompA_chckvlv spi0 water = 100.000000
CompA_chckvlv spo0 p_s = 101.324997
CompA_chckvlv spo0 h = 70.000000
CompA_chckvlv spo0 v = 0.001000
CompA_chckvlv spo0 av_visc = 0.001000
CompA_chckvlv spo0 water = 100.000000
CompA_gate r st_ind_max = 9
CompA_gate r index_h = 30
CompA_gate r from_out = 1
CompA_gate s h_in = 0.304800
CompA_gate s h_out = 0.304800
CompA_gate s d_in = 151.892303
CompA_gate s d_out = 151.892303
CompA_gate s t_vo = 5.000000
CompA_gate s t_vc = 5.000000
CompA_gate s cv_1 = 624.000000
CompA_gate s cv_2 = 1250.000000
CompA_gate s cv_3 = 1780.000000
CompA_gate s cv_4 = 2770.000000
CompA_gate s cv_5 = 3210.000000
CompA_gate s cv_6 = 3610.000000
CompA_gate s cv_7 = 3970.000000
CompA_gate s cv_8 = 4240.000000
CompA_gate s cv_9 = 4460.000000
CompA_gate s cv_10 = 4678.000000
CompA_gate s st_1 = 0.100000
CompA_gate s st_2 = 0.200000
CompA_gate s st_3 = 0.300000
CompA_gate s st_4 = 0.500000
CompA_gate s st_5 = 0.600000
CompA_gate s st_6 = 0.700000
CompA_gate s st_7 = 0.800000
CompA_gate s st_8 = 0.900000
CompA_gate s st_9 = 1.000000
CompA_gate s st_10 = 1.000000
CompA_gate s a_valve = 0.018120
CompA_gate s k_v = 999999986991104.000000
CompA_gate s a_in = 0.018120
CompA_gate s a_out = 0.018120
CompA_gate spi0 p_s = 101.324997
CompA_gate spi0 h = 70.000000
CompA_gate spi0 v = 0.001000
CompA_gate spi0 av_visc = 0.001000
CompA_gate spi0 water = 100.000000
CompA_gate spo0 p_s = 96.345711
CompA_gate spo0 h = 70.000000
CompA_gate spo0 v = 0.001000
CompA_gate spo0 av_visc = 0.001000
CompA_gate spo0 water = 100.000000
CompB_chckvlv r index_h = 30
CompB_chckvlv r index_max = 1
CompB_chckvlv s h_in = 0.304800
CompB_chckvlv s h_out = 0.304800
CompB_chckvlv s d_in = 151.892303
CompB_chckvlv s d_out = 151.892303
CompB_chckvlv s a_valve = 0.018120
CompB_chckvlv s a_in = 0.018120
CompB_chckvlv s a_out = 0.018120
CompB_chckvlv s q_0 = 0.025199
CompB_chckvlv s q_1 = 0.268013
CompB_chckvlv s dp_0 = 0.740000
CompB_chckvlv s dp_1 = 75.000000
CompB_chckvlv s dpmin = 0.740000
CompB_chckvlv s dpmax = 75.000000
CompB_chckvlv s debitmin = 0.025199
CompB_chckvlv s debitmax = 0.268013
CompB_chckvlv s itmax = 1.000000
CompB_chckvlv s eq_mass = 35.380001
CompB_chckvlv spi0 p_s = 101.324997
CompB_chckvlv spi0 h = 70.461746
CompB_chckvlv spi0 v = 0.001000
CompB_chckvlv spi0 av_visc = 0.001001
CompB_chckvlv spi0 water = 99.999969
CompB_chckvlv spo0 p_s = 101.324997
CompB_chckvlv spo0 h = 70.468079
CompB_chckvlv spo0 v = 0.001000
CompB_chckvlv spo0 av_visc = 0.001001
CompB_chckvlv spo0 water = 99.999969
CompB_gate r st_ind_max = 9
CompB_gate r index_h = 30
CompB_gate r from_out = 1
CompB_gate s h_in = 0.304800
CompB_gate s h_out = 0.304800
CompB_gate s d_in = 151.892303
CompB_gate s d_out = 151.892303
CompB_gate s t_vo = 5.000000
CompB_gate s t_vc = 5.000000
CompB_gate s cv_1 = 624.000000
CompB_gate s cv_2 = 1250.000000
CompB_gate s cv_3 = 1780.000000
CompB_gate s cv_4 = 2770.000000

CompB_gate s cv_5 = 3210.000000
CompB_gate s cv_6 = 3610.000000
CompB_gate s cv_7 = 3970.000000
CompB_gate s cv_8 = 4240.000000
CompB_gate s cv_9 = 4460.000000
CompB_gate s cv_10 = 4678.000000
CompB_gate s st_1 = 0.100000
CompB_gate s st_2 = 0.200000
CompB_gate s st_3 = 0.300000
CompB_gate s st_4 = 0.500000
CompB_gate s st_5 = 0.600000
CompB_gate s st_6 = 0.700000
CompB_gate s st_7 = 0.800000
CompB_gate s st_8 = 0.900000
CompB_gate s st_9 = 1.000000
CompB_gate s st_10 = 1.000000
CompB_gate s a_valve = 0.018120
CompB_gate s k_v = 999999986991104.000000
CompB_gate s a_in = 0.018120
CompB_gate s a_out = 0.018120
CompB_gate spi0 p_s = 101.324997
CompB_gate spi0 h = 70.477348
CompB_gate spi0 v = 0.001000
CompB_gate spi0 av_visc = 0.001001
CompB_gate spi0 water = 99.999977
CompB_gate spo0 p_s = -293.217926
CompB_gate spo0 h = 70.477348
CompB_gate spo0 v = 0.001000
CompB_gate spo0 av_visc = 0.001001
CompB_gate spo0 water = 99.999977
CompB_gate sr empty2 = 1
CompB_gate sr order = 1
CompB_gate sr clg_flag = 2
CompB_gate sr pump_loc = -1
CompB_gate ss hi_sct = 0.304800
CompB_gate ss ho_sct = 0.304800
CompB_gate ss ai_sct = 0.018120
CompB_gate ss ao_sct = 0.018120
CompB_gate ss v_sct = 0.001000
CompB_gate ss ad_max = 1.000000
CompB_gate ss sum_k =
999999986991104.000000
CompB_gate ss sum_k_a2 =
999999986991104.000000
CompB_gate ss l_sct = 3.048000
CompB_gate ss mu = 0.001000
CompB_gate ssp w_max = 100000.000000
CompB_gate ssp dp = 394.542908
CompC_chckvlv r index_h = 30
CompC_chckvlv r from_out = 1
CompC_chckvlv r index_max = 1
CompC_chckvlv s h_in = 0.304800
CompC_chckvlv s h_out = 0.304800
CompC_chckvlv s d_in = 151.892303
CompC_chckvlv s d_out = 151.892303
CompC_chckvlv s a_valve = 0.018120
CompC_chckvlv s a_in = 0.018120
CompC_chckvlv s a_out = 0.018120
CompC_chckvlv s velocity = 0.267949
CompC_chckvlv s q_0 = 0.025199
CompC_chckvlv s q_1 = 0.268013
CompC_chckvlv s dp_0 = 0.740000
CompC_chckvlv s dp_1 = 75.000000
CompC_chckvlv s dpmin = 0.740000
CompC_chckvlv s dpmax = 75.000000
CompC_chckvlv s debitmin = 0.025199
CompC_chckvlv s debitmax = 0.268013
CompC_chckvlv s itmax = 1.000000
CompC_chckvlv s eq_mass = 35.380001
CompC_chckvlv spi0 p_s = 101.324997
CompC_chckvlv spi0 h = 70.000175
CompC_chckvlv spi0 v = 0.001000
CompC_chckvlv spi0 av_visc = 0.001000
CompC_chckvlv spi0 water = 100.000000
CompC_chckvlv spo0 p_s = 101.324997
CompC_chckvlv spo0 h = 70.009270
CompC_chckvlv spo0 v = 0.001000
CompC_chckvlv spo0 av_visc = 0.001001
CompC_chckvlv spo0 water = 99.999985
CompC_gate r psn = 100
CompC_gate r st_ind_max = 9
CompC_gate r st_ind = 8
CompC_gate r index_h = 30
CompC_gate r from_out = 1
CompC_gate s h_in = 0.304800
CompC_gate s h_out = 0.304800
CompC_gate s d_in = 151.892303
CompC_gate s d_out = 151.892303
CompC_gate s t_vo = 5.000000
CompC_gate s t_vc = 5.000000
CompC_gate s cv_1 = 624.000000
CompC_gate s cv_2 = 1250.000000
CompC_gate s cv_3 = 1780.000000
CompC_gate s cv_4 = 2770.000000
CompC_gate s cv_5 = 3210.000000
CompC_gate s cv_6 = 3610.000000
CompC_gate s cv_7 = 3970.000000
CompC_gate s cv_8 = 4240.000000
CompC_gate s cv_9 = 4460.000000
CompC_gate s cv_10 = 4678.000000
CompC_gate s st_1 = 0.100000
CompC_gate s st_2 = 0.200000
CompC_gate s st_3 = 0.300000
CompC_gate s st_4 = 0.500000
CompC_gate s st_5 = 0.600000
CompC_gate s st_6 = 0.700000
CompC_gate s st_7 = 0.800000
CompC_gate s st_8 = 0.900000
CompC_gate s st_9 = 1.000000
CompC_gate s st_10 = 1.000000
CompC_gate s a_valve = 0.018120
CompC_gate s stem = 1.000000

CompC_gate s stem_prv = 1.000000
CompC_gate s position = 100.000000
CompC_gate s k_v = 0.057475
CompC_gate s a_in = 0.018120
CompC_gate s a_out = 0.018120
CompC_gate spi0 p_s = 101.304298
CompC_gate spi0 h = 70.009270
CompC_gate spi0 v = 0.001000
CompC_gate spi0 av_visc = 0.001000
CompC_gate spi0 water = 99.999985
CompC_gate spo0 p_s = -293.021118
CompC_gate spo0 h = 70.009270
CompC_gate spo0 v = 0.001000
CompC_gate spo0 av_visc = 0.001000
CompC_gate spo0 water = 99.999985
CompC_gate sr empty2 = 1
CompC_gate sr order = 1
CompC_gate sr clg_flag = 2
CompC_gate sr pump_loc = -1
CompC_gate ss hi_sct = 0.304800
CompC_gate ss ho_sct = 0.304800
CompC_gate ss ai_sct = 0.018120
CompC_gate ss ao_sct = 0.018120
CompC_gate ss v_sct = 0.001000
CompC_gate ss ad_max = 1.000000
CompC_gate ss sum_k = 1.898404
CompC_gate ss sum_k_a2 = 5781.808105
CompC_gate ss l_sct = 3.048000
CompC_gate ss mu = 0.001000
CompC_gate ssp dp = 394.346130
CompD_chckvlv r index_h = 30
CompD_chckvlv r index_max = 1
CompD_chckvlv s h_in = 0.304800
CompD_chckvlv s h_out = 0.304800
CompD_chckvlv s d_in = 151.892303
CompD_chckvlv s d_out = 151.892303
CompD_chckvlv s a_valve = 0.018120
CompD_chckvlv s a_in = 0.018120
CompD_chckvlv s a_out = 0.018120
CompD_chckvlv s q_0 = 0.025199
CompD_chckvlv s q_1 = 0.268013
CompD_chckvlv s dp_0 = 0.740000
CompD_chckvlv s dp_1 = 75.000000
CompD_chckvlv s dpmin = 0.740000
CompD_chckvlv s dpmax = 75.000000
CompD_chckvlv s debitmin = 0.025199
CompD_chckvlv s debitmax = 0.268013
CompD_chckvlv s itmax = 1.000000
CompD_chckvlv s eq_mass = 35.380001
CompD_chckvlv spi0 p_s = 101.324997
CompD_chckvlv spi0 h = 70.225914
CompD_chckvlv spi0 v = 0.001000
CompD_chckvlv spi0 av_visc = 0.001000
CompD_chckvlv spi0 water = 99.999992
CompD_chckvlv spo0 p_s = 101.324997
CompD_chckvlv spo0 h = 70.235962
CompD_chckvlv spo0 v = 0.001000
CompD_chckvlv spo0 av_visc = 0.001000
CompD_chckvlv spo0 water = 99.999992
CompD_gate r st_ind_max = 9
CompD_gate r index_h = 30
CompD_gate r from_out = 1
CompD_gate s h_in = 0.304800
CompD_gate s h_out = 0.304800
CompD_gate s d_in = 151.892303
CompD_gate s d_out = 151.892303
CompD_gate s t_vo = 5.000000
CompD_gate s t_vc = 5.000000
CompD_gate s cv_1 = 624.000000
CompD_gate s cv_2 = 1250.000000
CompD_gate s cv_3 = 1780.000000
CompD_gate s cv_4 = 2770.000000
CompD_gate s cv_5 = 3210.000000
CompD_gate s cv_6 = 3610.000000
CompD_gate s cv_7 = 3970.000000
CompD_gate s cv_8 = 4240.000000
CompD_gate s cv_9 = 4460.000000
CompD_gate s cv_10 = 4678.000000
CompD_gate s st_1 = 0.100000
CompD_gate s st_2 = 0.200000
CompD_gate s st_3 = 0.300000
CompD_gate s st_4 = 0.500000
CompD_gate s st_5 = 0.600000
CompD_gate s st_6 = 0.700000
CompD_gate s st_7 = 0.800000
CompD_gate s st_8 = 0.900000
CompD_gate s st_9 = 1.000000
CompD_gate s st_10 = 1.000000
CompD_gate s a_valve = 0.018120
CompD_gate s k_v = 999999986991104.000000
CompD_gate s a_in = 0.018120
CompD_gate s a_out = 0.018120
CompD_gate spi0 p_s = 101.324997
CompD_gate spi0 h = 70.239746
CompD_gate spi0 v = 0.001000
CompD_gate spi0 av_visc = 0.001000
CompD_gate spi0 water = 99.999992
CompD_gate spo0 p_s = -292.537598
CompD_gate spo0 h = 70.239746
CompD_gate spo0 v = 0.001000
CompD_gate spo0 av_visc = 0.001000
CompD_gate spo0 water = 99.999992
CompD_gate sr empty2 = 1
CompD_gate sr order = 1
CompD_gate sr clg_flag = 2
CompD_gate sr pump_loc = -1
CompD_gate ss hi_sct = 0.304800
CompD_gate ss ho_sct = 0.304800
CompD_gate ss ai_sct = 0.018120
CompD_gate ss ao_sct = 0.018120
CompD_gate ss v_sct = 0.001000
CompD_gate ss ad_max = 1.000000

CompD_gate ss sum_k =
999999986991104.000000
CompD_gate ss sum_k_a2 =
999999986991104.000000
CompD_gate ss l_sct = 3.048000
CompD_gate ss mu = 0.001000
CompD_gate ssp w_max = 100000.000000
CompD_gate ssp dp = 393.862610
CompE_chckvlv r index_h = 30
CompE_chckvlv r index_max = 1
CompE_chckvlv s h_in = 0.304800
CompE_chckvlv s h_out = 0.304800
CompE_chckvlv s d_in = 151.892303
CompE_chckvlv s d_out = 151.892303
CompE_chckvlv s a_valve = 0.018120
CompE_chckvlv s a_in = 0.018120
CompE_chckvlv s a_out = 0.018120
CompE_chckvlv s q_0 = 0.025199
CompE_chckvlv s q_1 = 0.268013
CompE_chckvlv s dp_0 = 0.740000
CompE_chckvlv s dp_1 = 75.000000
CompE_chckvlv s dpmin = 0.740000
CompE_chckvlv s dpmax = 75.000000
CompE_chckvlv s debitmin = 0.025199
CompE_chckvlv s debitmax = 0.268013
CompE_chckvlv s itmax = 1.000000
CompE_chckvlv s eq_mass = 35.380001
CompE_chckvlv spi0 p_s = 101.324997
CompE_chckvlv spi0 h = 70.000000
CompE_chckvlv spi0 v = 0.001000
CompE_chckvlv spi0 av_visc = 0.001000
CompE_chckvlv spi0 water = 100.000000
CompE_chckvlv spo0 p_s = 101.324997
CompE_chckvlv spo0 h = 70.000000
CompE_chckvlv spo0 v = 0.001000
CompE_chckvlv spo0 av_visc = 0.001000
CompE_chckvlv spo0 water = 100.000000
CompE_gate r st_ind_max = 9
CompE_gate r index_h = 30
CompE_gate r from_out = 1
CompE_gate s h_in = 0.304800
CompE_gate s h_out = 0.304800
CompE_gate s d_in = 151.892303
CompE_gate s d_out = 151.892303
CompE_gate s t_vo = 5.000000
CompE_gate s t_vc = 5.000000
CompE_gate s cv_1 = 624.000000
CompE_gate s cv_2 = 1250.000000
CompE_gate s cv_3 = 1780.000000
CompE_gate s cv_4 = 2770.000000
CompE_gate s cv_5 = 3210.000000
CompE_gate s cv_6 = 3610.000000
CompE_gate s cv_7 = 3970.000000
CompE_gate s cv_8 = 4240.000000
CompE_gate s cv_9 = 4460.000000
CompE_gate s cv_10 = 4678.000000
CompE_gate s st_1 = 0.100000
CompE_gate s st_2 = 0.200000
CompE_gate s st_3 = 0.300000
CompE_gate s st_4 = 0.500000
CompE_gate s st_5 = 0.600000
CompE_gate s st_6 = 0.700000
CompE_gate s st_7 = 0.800000
CompE_gate s st_8 = 0.900000
CompE_gate s st_9 = 1.000000
CompE_gate s st_10 = 1.000000
CompE_gate s a_valve = 0.018120
CompE_gate s k_v = 999999986991104.000000
CompE_gate s a_in = 0.018120
CompE_gate s a_out = 0.018120
CompE_gate spi0 p_s = 101.324997
CompE_gate spi0 h = 70.000000
CompE_gate spi0 v = 0.001000
CompE_gate spi0 av_visc = 0.001000
CompE_gate spi0 water = 100.000000
CompE_gate spo0 p_s = -291.319153
CompE_gate spo0 h = 70.000000
CompE_gate spo0 v = 0.001000
CompE_gate spo0 av_visc = 0.001000
CompE_gate spo0 water = 100.000000
CompE_gate sr empty2 = 1
CompE_gate sr order = 1
CompE_gate sr clg_flag = 2
CompE_gate sr pump_loc = -1
CompE_gate ss hi_sct = 0.304800
CompE_gate ss ho_sct = 0.304800
CompE_gate ss ai_sct = 0.018120
CompE_gate ss ao_sct = 0.018120
CompE_gate ss v_sct = 0.001000
CompE_gate ss ad_max = 1.000000
CompE_gate ss sum_k =
999999986991104.000000
CompE_gate ss sum_k_a2 =
999999986991104.000000
CompE_gate ss l_sct = 3.048000
CompE_gate ss mu = 0.001000
CompE_gate ssp w_max = 100000.000000
CompE_gate ssp dp = 392.644165
CompF_chckvlv r index_h = 30
CompF_chckvlv r index_max = 1
CompF_chckvlv s h_in = 0.304800
CompF_chckvlv s h_out = 0.304800
CompF_chckvlv s d_in = 151.892303
CompF_chckvlv s d_out = 151.892303
CompF_chckvlv s a_valve = 0.018120
CompF_chckvlv s a_in = 0.018120
CompF_chckvlv s a_out = 0.018120
CompF_chckvlv s q_0 = 0.025199
CompF_chckvlv s q_1 = 0.268013
CompF_chckvlv s dp_0 = 0.740000
CompF_chckvlv s dp_1 = 75.000000
CompF_chckvlv s dpmin = 0.740000

CompF_chckvlv s dpmax = 75.000000
CompF_chckvlv s debitmin = 0.025199
CompF_chckvlv s debitmax = 0.268013
CompF_chckvlv s itmax = 1.000000
CompF_chckvlv s eq_mass = 35.380001
CompF_chckvlv spi0 p_s = 101.324997
CompF_chckvlv spi0 h = 70.000000
CompF_chckvlv spi0 v = 0.001000
CompF_chckvlv spi0 av_visc = 0.001000
CompF_chckvlv spi0 water = 100.000000
CompF_chckvlv spo0 p_s = 101.324997
CompF_chckvlv spo0 h = 70.000000
CompF_chckvlv spo0 v = 0.001000
CompF_chckvlv spo0 av_visc = 0.001000
CompF_chckvlv spo0 water = 100.000000
CompF_gate r st_ind_max = 9
CompF_gate r index_h = 30
CompF_gate r from_out = 1
CompF_gate s h_in = 0.304800
CompF_gate s h_out = 0.304800
CompF_gate s d_in = 151.892303
CompF_gate s d_out = 151.892303
CompF_gate s t_vo = 5.000000
CompF_gate s t_vc = 5.000000
CompF_gate s cv_1 = 624.000000
CompF_gate s cv_2 = 1250.000000
CompF_gate s cv_3 = 1780.000000
CompF_gate s cv_4 = 2770.000000
CompF_gate s cv_5 = 3210.000000
CompF_gate s cv_6 = 3610.000000
CompF_gate s cv_7 = 3970.000000
CompF_gate s cv_8 = 4240.000000
CompF_gate s cv_9 = 4460.000000
CompF_gate s cv_10 = 4678.000000
CompF_gate s st_1 = 0.100000
CompF_gate s st_2 = 0.200000
CompF_gate s st_3 = 0.300000
CompF_gate s st_4 = 0.500000
CompF_gate s st_5 = 0.600000
CompF_gate s st_6 = 0.700000
CompF_gate s st_7 = 0.800000
CompF_gate s st_8 = 0.900000
CompF_gate s st_9 = 1.000000
CompF_gate s st_10 = 1.000000
CompF_gate s a_valve = 0.018120
CompF_gate s k_v = 999999986991104.000000
CompF_gate s a_in = 0.018120
CompF_gate s a_out = 0.018120
CompF_gate spi0 p_s = 101.324997
CompF_gate spi0 h = 70.000000
CompF_gate spi0 v = 0.001000
CompF_gate spi0 av_visc = 0.001000
CompF_gate spi0 water = 100.000000
CompF_gate spo0 p_s = -290.486145
CompF_gate spo0 h = 70.000000
CompF_gate spo0 v = 0.001000
CompF_gate spo0 av_visc = 0.001000
CompF_gate spo0 water = 100.000000
CompF_gate sr empty2 = 1
CompF_gate sr order = 1
CompF_gate sr clg_flag = 2
CompF_gate sr pump_loc = -1
CompF_gate ss hi_sct = 0.304800
CompF_gate ss ho_sct = 0.304800
CompF_gate ss ai_sct = 0.018120
CompF_gate ss ao_sct = 0.018120
CompF_gate ss v_sct = 0.001000
CompF_gate ss ad_max = 1.000000
CompF_gate ss sum_k =
999999986991104.000000
CompF_gate ss sum_k_a2 =
999999986991104.000000
CompF_gate ss l_sct = 3.048000
CompF_gate ss mu = 0.001000
CompF_gate ssp w_max = 100000.000000
CompF_gate ssp dp = 391.811157
CompG_chckvlv r index_h = 30
CompG_chckvlv r index_max = 1
CompG_chckvlv s h_in = 0.304800
CompG_chckvlv s h_out = 0.304800
CompG_chckvlv s d_in = 151.892303
CompG_chckvlv s d_out = 151.892303
CompG_chckvlv s a_valve = 0.018120
CompG_chckvlv s a_in = 0.018120
CompG_chckvlv s a_out = 0.018120
CompG_chckvlv s q_0 = 0.025199
CompG_chckvlv s q_1 = 0.268013
CompG_chckvlv s dp_0 = 0.740000
CompG_chckvlv s dp_1 = 75.000000
CompG_chckvlv s dpmin = 0.740000
CompG_chckvlv s dpmax = 75.000000
CompG_chckvlv s debitmin = 0.025199
CompG_chckvlv s debitmax = 0.268013
CompG_chckvlv s itmax = 1.000000
CompG_chckvlv s eq_mass = 35.380001
CompG_chckvlv spi0 p_s = 101.324997
CompG_chckvlv spi0 h = 70.000000
CompG_chckvlv spi0 v = 0.001000
CompG_chckvlv spi0 av_visc = 0.001000
CompG_chckvlv spi0 water = 100.000000
CompG_chckvlv spo0 p_s = 101.324997
CompG_chckvlv spo0 h = 70.000000
CompG_chckvlv spo0 v = 0.001000
CompG_chckvlv spo0 av_visc = 0.001000
CompG_chckvlv spo0 water = 100.000000
CompG_gate r st_ind_max = 9
CompG_gate r index_h = 30
CompG_gate r from_out = 1
CompG_gate s h_in = 0.304800
CompG_gate s h_out = 0.304800
CompG_gate s d_in = 151.892303
CompG_gate s d_out = 151.892303

CompG_gate s t_vo = 5.000000
CompG_gate s t_vc = 5.000000
CompG_gate s cv_1 = 624.000000
CompG_gate s cv_2 = 1250.000000
CompG_gate s cv_3 = 1780.000000
CompG_gate s cv_4 = 2770.000000
CompG_gate s cv_5 = 3210.000000
CompG_gate s cv_6 = 3610.000000
CompG_gate s cv_7 = 3970.000000
CompG_gate s cv_8 = 4240.000000
CompG_gate s cv_9 = 4460.000000
CompG_gate s cv_10 = 4678.000000
CompG_gate s st_1 = 0.100000
CompG_gate s st_2 = 0.200000
CompG_gate s st_3 = 0.300000
CompG_gate s st_4 = 0.500000
CompG_gate s st_5 = 0.600000
CompG_gate s st_6 = 0.700000
CompG_gate s st_7 = 0.800000
CompG_gate s st_8 = 0.900000
CompG_gate s st_9 = 1.000000
CompG_gate s st_10 = 1.000000
CompG_gate s a_valve = 0.018120
CompG_gate s k_v = 999999986991104.000000
CompG_gate s a_in = 0.018120
CompG_gate s a_out = 0.018120
CompG_gate spi0 p_s = 101.324997
CompG_gate spi0 h = 70.000000
CompG_gate spi0 v = 0.001000
CompG_gate spi0 av_visc = 0.001000
CompG_gate spi0 water = 100.000000
CompG_gate spo0 p_s = -289.602631
CompG_gate spo0 h = 70.000000
CompG_gate spo0 v = 0.001000
CompG_gate spo0 av_visc = 0.001000
CompG_gate spo0 water = 100.000000
CompG_gate sr empty2 = 1
CompG_gate sr order = 1
CompG_gate sr clg_flag = 2
CompG_gate sr pump_loc = -1
CompG_gate ss hi_sct = 0.304800
CompG_gate ss ho_sct = 0.304800
CompG_gate ss ai_sct = 0.018120
CompG_gate ss ao_sct = 0.018120
CompG_gate ss v_sct = 0.001000
CompG_gate ss ad_max = 1.000000
CompG_gate ss sum_k =
999999986991104.000000
CompG_gate ss sum_k_a2 =
999999986991104.000000
CompG_gate ss l_sct = 3.048000
CompG_gate ss mu = 0.001000
CompG_gate ssp w_max = 100000.000000
CompG_gate ssp dp = 390.927612
CompH_chckvlv r index_h = 30
CompH_chckvlv r index_max = 1
CompH_chckvlv s h_in = 0.304800
CompH_chckvlv s h_out = 0.304800
CompH_chckvlv s d_in = 151.892303
CompH_chckvlv s d_out = 151.892303
CompH_chckvlv s a_valve = 0.018120
CompH_chckvlv s a_in = 0.018120
CompH_chckvlv s a_out = 0.018120
CompH_chckvlv s q_0 = 0.025199
CompH_chckvlv s q_1 = 0.268013
CompH_chckvlv s dp_0 = 0.740000
CompH_chckvlv s dp_1 = 75.000000
CompH_chckvlv s dpmin = 0.740000
CompH_chckvlv s dpmax = 75.000000
CompH_chckvlv s debitmin = 0.025199
CompH_chckvlv s debitmax = 0.268013
CompH_chckvlv s itmax = 1.000000
CompH_chckvlv s eq_mass = 35.380001
CompH_chckvlv spi0 p_s = 101.324997
CompH_chckvlv spi0 h = 70.000000
CompH_chckvlv spi0 v = 0.001000
CompH_chckvlv spi0 av_visc = 0.001000
CompH_chckvlv spi0 water = 100.000000
CompH_chckvlv spo0 p_s = 101.324997
CompH_chckvlv spo0 h = 70.000000
CompH_chckvlv spo0 v = 0.001000
CompH_chckvlv spo0 av_visc = 0.001000
CompH_chckvlv spo0 water = 100.000000
CompH_gate r st_ind_max = 9
CompH_gate r index_h = 30
CompH_gate r from_out = 1
CompH_gate s h_in = 0.304800
CompH_gate s h_out = 0.304800
CompH_gate s d_in = 151.892303
CompH_gate s d_out = 151.892303
CompH_gate s t_vo = 5.000000
CompH_gate s t_vc = 5.000000
CompH_gate s cv_1 = 624.000000
CompH_gate s cv_2 = 1250.000000
CompH_gate s cv_3 = 1780.000000
CompH_gate s cv_4 = 2770.000000
CompH_gate s cv_5 = 3210.000000
CompH_gate s cv_6 = 3610.000000
CompH_gate s cv_7 = 3970.000000
CompH_gate s cv_8 = 4240.000000
CompH_gate s cv_9 = 4460.000000
CompH_gate s cv_10 = 4678.000000
CompH_gate s st_1 = 0.100000
CompH_gate s st_2 = 0.200000
CompH_gate s st_3 = 0.300000
CompH_gate s st_4 = 0.500000
CompH_gate s st_5 = 0.600000
CompH_gate s st_6 = 0.700000
CompH_gate s st_7 = 0.800000
CompH_gate s st_8 = 0.900000
CompH_gate s st_9 = 1.000000
CompH_gate s st_10 = 1.000000

CompH_gate s a_valve = 0.018120
CompH_gate s k_v = 999999986991104.000000
CompH_gate s a_in = 0.018120
CompH_gate s a_out = 0.018120
CompH_gate spi0 p_s = 101.324997
CompH_gate spi0 h = 70.000000
CompH_gate spi0 v = 0.001000
CompH_gate spi0 av_visc = 0.001000
CompH_gate spi0 water = 100.000000
CompH_gate spo0 p_s = -289.193359
CompH_gate spo0 h = 70.000000
CompH_gate spo0 v = 0.001000
CompH_gate spo0 av_visc = 0.001000
CompH_gate spo0 water = 100.000000
CompH_gate sr empty2 = 1
CompH_gate sr order = 1
CompH_gate sr clg_flag = 2
CompH_gate sr pump_loc = -1
CompH_gate ss hi_sct = 0.304800
CompH_gate ss ho_sct = 0.304800
CompH_gate ss ai_sct = 0.018120
CompH_gate ss ao_sct = 0.018120
CompH_gate ss v_sct = 0.001000
CompH_gate ss ad_max = 1.000000
CompH_gate ss sum_k =
999999986991104.000000
CompH_gate ss sum_k_a2 =
999999986991104.000000
CompH_gate ss l_sct = 3.048000
CompH_gate ss mu = 0.001000
CompH_gate ssp w_max = 100000.000000
CompH_gate ssp dp = 390.518372
CompI_chckvlv r index_h = 30
CompI_chckvlv r index_max = 1
CompI_chckvlv s h_in = 0.304800
CompI_chckvlv s h_out = 0.304800
CompI_chckvlv s d_in = 151.892303
CompI_chckvlv s d_out = 151.892303
CompI_chckvlv s a_valve = 0.018120
CompI_chckvlv s a_in = 0.018120
CompI_chckvlv s a_out = 0.018120
CompI_chckvlv s q_0 = 0.025199
CompI_chckvlv s q_1 = 0.268013
CompI_chckvlv s dp_0 = 0.740000
CompI_chckvlv s dp_1 = 75.000000
CompI_chckvlv s dpmin = 0.740000
CompI_chckvlv s dpmax = 75.000000
CompI_chckvlv s debitmin = 0.025199
CompI_chckvlv s debitmax = 0.268013
CompI_chckvlv s itmax = 1.000000
CompI_chckvlv s eq_mass = 35.380001
CompI_chckvlv spi0 p_s = 101.324997
CompI_chckvlv spi0 h = 70.000000
CompI_chckvlv spi0 v = 0.001000
CompI_chckvlv spi0 av_visc = 0.001000
CompI_chckvlv spi0 water = 100.000000
CompI_chckvlv spo0 p_s = 101.324997
CompI_chckvlv spo0 h = 70.000000
CompI_chckvlv spo0 v = 0.001000
CompI_chckvlv spo0 av_visc = 0.001000
CompI_chckvlv spo0 water = 100.000000
CompI_gate r st_ind_max = 9
CompI_gate r index_h = 30
CompI_gate r from_out = 1
CompI_gate s h_in = 0.304800
CompI_gate s h_out = 0.304800
CompI_gate s d_in = 151.892303
CompI_gate s d_out = 151.892303
CompI_gate s t_vo = 5.000000
CompI_gate s t_vc = 5.000000
CompI_gate s cv_1 = 624.000000
CompI_gate s cv_2 = 1250.000000
CompI_gate s cv_3 = 1780.000000
CompI_gate s cv_4 = 2770.000000
CompI_gate s cv_5 = 3210.000000
CompI_gate s cv_6 = 3610.000000
CompI_gate s cv_7 = 3970.000000
CompI_gate s cv_8 = 4240.000000
CompI_gate s cv_9 = 4460.000000
CompI_gate s cv_10 = 4678.000000
CompI_gate s st_1 = 0.100000
CompI_gate s st_2 = 0.200000
CompI_gate s st_3 = 0.300000
CompI_gate s st_4 = 0.500000
CompI_gate s st_5 = 0.600000
CompI_gate s st_6 = 0.700000
CompI_gate s st_7 = 0.800000
CompI_gate s st_8 = 0.900000
CompI_gate s st_9 = 1.000000
CompI_gate s st_10 = 1.000000
CompI_gate s a_valve = 0.018120
CompI_gate s k_v = 999999986991104.000000
CompI_gate s a_in = 0.018120
CompI_gate s a_out = 0.018120
CompI_gate spi0 p_s = 101.324997
CompI_gate spi0 h = 70.000000
CompI_gate spi0 v = 0.001000
CompI_gate spi0 av_visc = 0.001000
CompI_gate spi0 water = 100.000000
CompI_gate spo0 p_s = -288.972076
CompI_gate spo0 h = 70.000000
CompI_gate spo0 v = 0.001000
CompI_gate spo0 av_visc = 0.001000
CompI_gate spo0 water = 100.000000
CompI_gate sr empty2 = 1
CompI_gate sr order = 1
CompI_gate sr clg_flag = 2
CompI_gate sr pump_loc = -1
CompI_gate ss hi_sct = 0.304800
CompI_gate ss ho_sct = 0.304800
CompI_gate ss ai_sct = 0.018120
CompI_gate ss ao_sct = 0.018120

CompI_gate ss v_sct = 0.001000
CompI_gate ss ad_max = 1.000000
CompI_gate ss sum_k =
999999986991104.000000
CompI_gate ss sum_k_a2 =
999999986991104.000000
CompI_gate ss l_sct = 3.048000
CompI_gate ss mu = 0.001000
CompI_gate ssp w_max = 100000.000000
CompI_gate ssp dp = 390.297058
CompJ_chckvlv r index_h = 30
CompJ_chckvlv r index_max = 1
CompJ_chckvlv s h_in = 0.304800
CompJ_chckvlv s h_out = 0.304800
CompJ_chckvlv s d_in = 151.892303
CompJ_chckvlv s d_out = 151.892303
CompJ_chckvlv s a_valve = 0.018120
CompJ_chckvlv s a_in = 0.018120
CompJ_chckvlv s a_out = 0.018120
CompJ_chckvlv s q_0 = 0.025199
CompJ_chckvlv s q_1 = 0.268013
CompJ_chckvlv s dp_0 = 0.740000
CompJ_chckvlv s dp_1 = 75.000000
CompJ_chckvlv s dpmin = 0.740000
CompJ_chckvlv s dpmax = 75.000000
CompJ_chckvlv s debitmin = 0.025199
CompJ_chckvlv s debitmax = 0.268013
CompJ_chckvlv s itmax = 1.000000
CompJ_chckvlv s eq_mass = 35.380001
CompJ_chckvlv spi0 p_s = 101.324997
CompJ_chckvlv spi0 h = 70.000000
CompJ_chckvlv spi0 v = 0.001000
CompJ_chckvlv spi0 av_visc = 0.001000
CompJ_chckvlv spi0 water = 100.000000
CompJ_chckvlv spo0 p_s = 101.324997
CompJ_chckvlv spo0 h = 70.000000
CompJ_chckvlv spo0 v = 0.001000
CompJ_chckvlv spo0 av_visc = 0.001000
CompJ_chckvlv spo0 water = 100.000000
CompJ_gate r st_ind_max = 9
CompJ_gate r index_h = 30
CompJ_gate r from_out = 1
CompJ_gate s h_in = 0.304800
CompJ_gate s h_out = 0.304800
CompJ_gate s d_in = 151.892303
CompJ_gate s d_out = 151.892303
CompJ_gate s t_vo = 5.000000
CompJ_gate s t_vc = 5.000000
CompJ_gate s cv_2 = 1250.000000
CompJ_gate s cv_3 = 1780.000000
CompJ_gate s cv_4 = 2770.000000
CompJ_gate s cv_5 = 3210.000000
CompJ_gate s cv_6 = 3610.000000
CompJ_gate s cv_7 = 3970.000000
CompJ_gate s cv_8 = 4240.000000
CompJ_gate s cv_9 = 4460.000000
CompJ_gate s cv_10 = 4678.000000
CompJ_gate s st_1 = 0.100000
CompJ_gate s st_2 = 0.200000
CompJ_gate s st_3 = 0.300000
CompJ_gate s st_4 = 0.500000
CompJ_gate s st_5 = 0.600000
CompJ_gate s st_6 = 0.700000
CompJ_gate s st_7 = 0.800000
CompJ_gate s st_8 = 0.900000
CompJ_gate s st_9 = 1.000000
CompJ_gate s st_10 = 1.000000
CompJ_gate s a_valve = 0.018120
CompJ_gate s k_v = 999999986991104.000000
CompJ_gate s a_in = 0.018120
CompJ_gate s a_out = 0.018120
CompJ_gate spi0 p_s = 101.324997
CompJ_gate spi0 h = 70.000000
CompJ_gate spi0 v = 0.001000
CompJ_gate spi0 av_visc = 0.001000
CompJ_gate spi0 water = 100.000000
CompJ_gate spo0 p_s = 89.524017
CompJ_gate spo0 h = 70.000000
CompJ_gate spo0 v = 0.001000
CompJ_gate spo0 av_visc = 0.001000
CompJ_gate spo0 water = 100.000000
Compartment_A r index_max = 9
Compartment_A r nb_out = 10
Compartment_A s leak_cnd = 10.000000
Compartment_A s l_1 = 1.354667
Compartment_A s l_2 = 2.709333
Compartment_A s l_3 = 4.064000
Compartment_A s l_4 = 5.418667
Compartment_A s l_5 = 6.773333
Compartment_A s l_6 = 8.127999
Compartment_A s l_7 = 9.482666
Compartment_A s l_8 = 10.837334
Compartment_A s l_9 = 12.191999
Compartment_A s v_1 = 6.172350
Compartment_A s v_2 = 23.740396
Compartment_A s v_3 = 51.279072
Compartment_A s v_4 = 87.364449
Compartment_A s v_5 = 130.572327
Compartment_A s v_6 = 179.476761
Compartment_A s v_7 = 232.654984
Compartment_A s v_8 = 288.682190
Compartment_A s v_9 = 346.133606
Compartment_A s mlf_lvl = 0.100000
Compartment_A s mlf_temp = 25.000000
Compartment_A s h_tk_prv = 104.669998
Compartment_A s h_tk = 104.669998
Compartment_A s l_tk = 0.012192
Compartment_A s m_tk = 55.551144
Compartment_A s t_tk = 25.000000
Compartment_A s m_tk_prv = 55.551144
Compartment_A s vol = 55.551144
Compartment_A s v_tk = 0.055551

Compartment_A s v_tk_prv = 0.055551
Compartment_A s p_tk = 101.444603
Compartment_A s rho_tk = 999.999939
Compartment_A s vspec_tk = 0.001000
Compartment_A s lvl_per = 0.100000
Compartment_A s water_p = 100.000000
Compartment_A s av_visc_tk = 0.001112
Compartment_A s Cp_f3gp_11 = 4.186800
Compartment_A s Cp_f3gp_15 = 4.186800
Compartment_A s Cp_f3gp_25 = 4.186800
Compartment_A s Cp_spare = 4.186800
Compartment_A s v_f3gp_11m = 0.001000
Compartment_A s v_f3gp_15m = 0.001000
Compartment_A s v_f3gp_25m = 0.001000
Compartment_A s v_spare = 0.001000
Compartment_A spi0 p_s = 101.324997
Compartment_A spi0 h = 70.000000
Compartment_A spi0 v = 0.001000
Compartment_A spi0 av_visc = 0.001000
Compartment_A spi0 water = 100.000000
Compartment_A spi1 p_s = 101.324997
Compartment_A spi1 h = 70.000000
Compartment_A spi1 v = 0.001000
Compartment_A spi1 av_visc = 0.001000
Compartment_A spi1 water = 100.000000
Compartment_A spi2 p_s = 101.300003
Compartment_A spi2 h = 70.000000
Compartment_A spi2 v = 0.001000
Compartment_A spi2 av_visc = 0.001000
Compartment_A spi2 water = 100.000000
Compartment_A spi3 p_s = 101.300003
Compartment_A spi3 h = 70.000000
Compartment_A spi3 v = 0.001000
Compartment_A spi3 av_visc = 0.001000
Compartment_A spi3 water = 100.000000
Compartment_A spi4 p_s = 101.300003
Compartment_A spi4 h = 70.000000
Compartment_A spi4 v = 0.001000
Compartment_A spi4 av_visc = 0.001000
Compartment_A spi4 water = 100.000000
Compartment_A spo0 p_s = 101.300003
Compartment_A spo0 h = 70.000000
Compartment_A spo0 v = 0.001000
Compartment_A spo0 av_visc = 0.001000
Compartment_A spo0 water = 100.000000
Compartment_A spo1 p_s = 101.300003
Compartment_A spo1 h = 70.000000
Compartment_A spo1 v = 0.001000
Compartment_A spo1 av_visc = 0.001000
Compartment_A spo1 water = 100.000000
Compartment_A spo2 p_s = 101.324997
Compartment_A spo2 h = 70.000000
Compartment_A spo2 v = 0.001000
Compartment_A spo2 av_visc = 0.001000
Compartment_A spo2 water = 100.000000
Compartment_A spo3 p_s = 101.300003
Compartment_A spo3 h = 70.000000
Compartment_A spo3 v = 0.001000
Compartment_A spo3 av_visc = 0.001000
Compartment_A spo3 water = 100.000000
Compartment_A spo4 p_s = 101.300003
Compartment_A spo4 h = 70.000000
Compartment_A spo4 v = 0.001000
Compartment_A spo4 av_visc = 0.001000
Compartment_A spo4 water = 100.000000
Compartment_A spo5 lvl_inst = 0.012192
Compartment_A spo6 tmp_inst = 25.000000
Compartment_B r index_max = 9
Compartment_B r nb_out = 10
Compartment_B s leak_cnd = 10.000000
Compartment_B s l_1 = 1.354667
Compartment_B s l_2 = 2.709333
Compartment_B s l_3 = 4.064000
Compartment_B s l_4 = 5.418667
Compartment_B s l_5 = 6.773333
Compartment_B s l_6 = 8.127999
Compartment_B s l_7 = 9.482666
Compartment_B s l_8 = 10.837334
Compartment_B s l_9 = 12.191999
Compartment_B s v_1 = 8.767032
Compartment_B s v_2 = 33.719810
Compartment_B s v_3 = 72.834869
Compartment_B s v_4 = 124.089012
Compartment_B s v_5 = 185.459366
Compartment_B s v_6 = 254.922180
Compartment_B s v_7 = 330.454803
Compartment_B s v_8 = 410.033508
Compartment_B s v_9 = 491.635681
Compartment_B s mlf_lvl = 0.100000
Compartment_B s mlf_temp = 16.783258
Compartment_B s h_tk_prv = 70.268150
Compartment_B s h_tk = 70.268150
Compartment_B s l_tk = 0.012192
Compartment_B s m_tk = 78.903259
Compartment_B s t_tk = 16.783258
Compartment_B s m_tk_prv = 78.903259
Compartment_B s vol = 78.903282
Compartment_B s v_tk = 0.078903
Compartment_B s v_tk_prv = 0.078903
Compartment_B s p_tk = 101.444603
Compartment_B s rho_tk = 999.999695
Compartment_B s vspec_tk = 0.001000
Compartment_B s lvl_per = 0.100000
Compartment_B s water_p = 99.999977
Compartment_B s av_visc_tk = 0.001018
Compartment_B s Cp_f3gp_11 = 4.186800
Compartment_B s Cp_f3gp_15 = 4.186800
Compartment_B s Cp_f3gp_25 = 4.186800
Compartment_B s Cp_spare = 4.186800
Compartment_B s v_f3gp_11m = 0.001000
Compartment_B s v_f3gp_15m = 0.001000
Compartment_B s v_f3gp_25m = 0.001000

Compartment_B s v_spare = 0.001000
Compartment_B spi0 p_s = 101.324997
Compartment_B spi0 h = 70.027069
Compartment_B spi0 v = 0.001000
Compartment_B spi0 av_visc = 0.001000
Compartment_B spi0 water = 99.999977
Compartment_B spi1 p_s = 101.324997
Compartment_B spi1 h = 70.000000
Compartment_B spi1 v = 0.001000
Compartment_B spi1 av_visc = 0.001000
Compartment_B spi1 water = 100.000000
Compartment_B spi2 p_s = 101.300003
Compartment_B spi2 h = 70.000000
Compartment_B spi2 v = 0.001000
Compartment_B spi2 av_visc = 0.001000
Compartment_B spi2 water = 100.000000
Compartment_B spi3 p_s = 101.300003
Compartment_B spi3 h = 70.000000
Compartment_B spi3 v = 0.001000
Compartment_B spi3 av_visc = 0.001000
Compartment_B spi3 water = 100.000000
Compartment_B spi4 p_s = 101.300003
Compartment_B spi4 h = 70.000000
Compartment_B spi4 v = 0.001000
Compartment_B spi4 av_visc = 0.001000
Compartment_B spi4 water = 100.000000
Compartment_B spo0 p_s = 101.300003
Compartment_B spo0 h = 70.000000
Compartment_B spo0 v = 0.001000
Compartment_B spo0 av_visc = 0.001000
Compartment_B spo0 water = 100.000000
Compartment_B spo1 p_s = 101.300003
Compartment_B spo1 h = 70.000000
Compartment_B spo1 v = 0.001000
Compartment_B spo1 av_visc = 0.001000
Compartment_B spo1 water = 100.000000
Compartment_B spo2 p_s = 101.324997
Compartment_B spo2 h = 70.461746
Compartment_B spo2 v = 0.001000
Compartment_B spo2 av_visc = 0.001001
Compartment_B spo2 water = 99.999969
Compartment_B spo3 p_s = 101.300003
Compartment_B spo3 h = 70.000000
Compartment_B spo3 v = 0.001000
Compartment_B spo3 av_visc = 0.001000
Compartment_B spo3 water = 100.000000
Compartment_B spo4 p_s = 101.324997
Compartment_B spo4 h = 70.000000
Compartment_B spo4 v = 0.001000
Compartment_B spo4 av_visc = 0.001000
Compartment_B spo4 water = 100.000000
Compartment_B spo5 lvl_inst = 0.012192
Compartment_B spo6 tmp_inst = 16.783258
Compartment_C r index_max = 9
Compartment_C r nb_out = 10
Compartment_C s leak_cnd = 10.000000
Compartment_C s l_1 = 1.354667
Compartment_C s l_2 = 2.709333
Compartment_C s l_3 = 4.064000
Compartment_C s l_4 = 5.418667
Compartment_C s l_5 = 6.773333
Compartment_C s l_6 = 8.127999
Compartment_C s l_7 = 9.482666
Compartment_C s l_8 = 10.837334
Compartment_C s l_9 = 12.191999
Compartment_C s v_1 = 16.088608
Compartment_C s v_2 = 61.880112
Compartment_C s v_3 = 133.661179
Compartment_C s v_4 = 227.719070
Compartment_C s v_5 = 340.341034
Compartment_C s v_6 = 467.814270
Compartment_C s v_7 = 606.425842
Compartment_C s v_8 = 752.463135
Compartment_C s v_9 = 902.213806
Compartment_C s mlf_lvl = 0.523569
Compartment_C s mlf_temp = 16.719255
Compartment_C s w_net = 369.389648
Compartment_C s h_tk_prv = 70.000343
Compartment_C s h_tk = 70.000175
Compartment_C s l_tk = 0.063834
Compartment_C s m_tk = 758.114319
Compartment_C s t_tk = 16.719255
Compartment_C s m_tk_prv = 388.724670
Compartment_C s vol = 758.114319
Compartment_C s v_tk = 0.758114
Compartment_C s v_tk_prv = 0.388725
Compartment_C s p_tk = 101.951210
Compartment_C s rho_tk = 999.999939
Compartment_C s vspec_tk = 0.001000
Compartment_C s lvl_per = 0.523569
Compartment_C s water_p = 100.000000
Compartment_C s av_visc_tk = 0.001000
Compartment_C s Cp_f3gp_11 = 4.186800
Compartment_C s Cp_f3gp_15 = 4.186800
Compartment_C s Cp_f3gp_25 = 4.186800
Compartment_C s Cp_spare = 4.186800
Compartment_C s v_f3gp_11m = 0.001000
Compartment_C s v_f3gp_15m = 0.001000
Compartment_C s v_f3gp_25m = 0.001000
Compartment_C s v_spare = 0.001000
Compartment_C spi0 p_s = 101.324997
Compartment_C spi0 h = 70.027069
Compartment_C spi0 v = 0.001000
Compartment_C spi0 av_visc = 0.001000
Compartment_C spi0 water = 99.999977
Compartment_C spi1 p_s = 101.324997
Compartment_C spi1 h = 70.000000
Compartment_C spi1 v = 0.001000
Compartment_C spi1 av_visc = 0.001000
Compartment_C spi1 water = 100.000000
Compartment_C spi2 p_s = 101.300003
Compartment_C spi2 h = 70.000000

Compartment_C spi2 v = 0.001000
Compartment_C spi2 av_visc = 0.001000
Compartment_C spi2 water = 100.000000
Compartment_C spi3 p_s = 101.300003
Compartment_C spi3 h = 70.000000
Compartment_C spi3 v = 0.001000
Compartment_C spi3 av_visc = 0.001000
Compartment_C spi3 water = 100.000000
Compartment_C spi4 p_s = 101.300003
Compartment_C spi4 h = 70.000000
Compartment_C spi4 v = 0.001000
Compartment_C spi4 av_visc = 0.001000
Compartment_C spi4 water = 100.000000
Compartment_C spo0 p_s = 101.300003
Compartment_C spo0 h = 70.000000
Compartment_C spo0 v = 0.001000
Compartment_C spo0 av_visc = 0.001000
Compartment_C spo0 water = 100.000000
Compartment_C spo1 p_s = 101.300003
Compartment_C spo1 h = 70.000000
Compartment_C spo1 v = 0.001000
Compartment_C spo1 av_visc = 0.001000
Compartment_C spo1 water = 100.000000
Compartment_C spo2 p_s = 101.324997
Compartment_C spo2 h = 70.000175
Compartment_C spo2 v = 0.001000
Compartment_C spo2 av_visc = 0.001000
Compartment_C spo2 water = 100.000000
Compartment_C spo3 p_s = 101.300003
Compartment_C spo3 h = 70.000000
Compartment_C spo3 v = 0.001000
Compartment_C spo3 av_visc = 0.001000
Compartment_C spo3 water = 100.000000
Compartment_C spo4 p_s = 101.324997
Compartment_C spo4 h = 70.027069
Compartment_C spo4 v = 0.001000
Compartment_C spo4 av_visc = 0.001000
Compartment_C spo4 water = 99.999977
Compartment_C spo5 lvl_inst = 0.063834
Compartment_C spo6 tmp_inst = 16.719255
Compartment_D r index_max = 9
Compartment_D s leak_cnd = 10.000000
Compartment_D s l_1 = 1.354667
Compartment_D s l_2 = 2.709333
Compartment_D s l_3 = 4.064000
Compartment_D s l_4 = 5.418667
Compartment_D s l_5 = 6.773333
Compartment_D s l_6 = 8.127999
Compartment_D s l_7 = 9.482666
Compartment_D s l_8 = 10.837334
Compartment_D s l_9 = 12.191999
Compartment_D s v_1 = 14.423402
Compartment_D s v_2 = 55.474625
Compartment_D s v_3 = 119.825195
Compartment_D s v_4 = 204.146606
Compartment_D s v_5 = 305.110413
Compartment_D s v_6 = 419.388153
Compartment_D s v_7 = 543.651306
Compartment_D s v_8 = 674.571411
Compartment_D s v_9 = 808.820007
Compartment_D s mlf_lvl = 0.100000
Compartment_D s mlf_temp = 16.747805
Compartment_D s h_tk_prv = 70.119659
Compartment_D s h_tk = 70.119659
Compartment_D s l_tk = 0.012192
Compartment_D s m_tk = 129.810654
Compartment_D s t_tk = 16.747805
Compartment_D s m_tk_prv = 129.810654
Compartment_D s vol = 129.810623
Compartment_D s v_tk = 0.129811
Compartment_D s v_tk_prv = 0.129811
Compartment_D s p_tk = 101.444603
Compartment_D s rho_tk = 1000.000305
Compartment_D s vspec_tk = 0.001000
Compartment_D s lvl_per = 0.100000
Compartment_D s water_p = 99.999962
Compartment_D s av_visc_tk = 0.001020
Compartment_D s Cp_f3gp_11 = 4.186800
Compartment_D s Cp_f3gp_15 = 4.186800
Compartment_D s Cp_f3gp_25 = 4.186800
Compartment_D s Cp_spare = 4.186800
Compartment_D s v_f3gp_11m = 0.001000
Compartment_D s v_f3gp_15m = 0.001000
Compartment_D s v_f3gp_25m = 0.001000
Compartment_D s v_spare = 0.001000
Compartment_D spi0 p_s = 101.324997
Compartment_D spi0 h = 70.000000
Compartment_D spi0 v = 0.001000
Compartment_D spi0 av_visc = 0.001000
Compartment_D spi0 water = 100.000000
Compartment_D spi1 p_s = 101.324997
Compartment_D spi1 h = 70.000000
Compartment_D spi1 v = 0.001000
Compartment_D spi1 av_visc = 0.001000
Compartment_D spi1 water = 100.000000
Compartment_D spi2 p_s = 101.300003
Compartment_D spi2 h = 70.000000
Compartment_D spi2 v = 0.001000
Compartment_D spi2 av_visc = 0.001000
Compartment_D spi2 water = 100.000000
Compartment_D spi3 p_s = 101.300003
Compartment_D spi3 h = 70.000000
Compartment_D spi3 v = 0.001000
Compartment_D spi3 av_visc = 0.001000
Compartment_D spi3 water = 100.000000
Compartment_D spi4 p_s = 101.300003
Compartment_D spi4 h = 70.000000
Compartment_D spi4 v = 0.001000
Compartment_D spi4 av_visc = 0.001000
Compartment_D spi4 water = 100.000000
Compartment_D spo0 p_s = 101.300003
Compartment_D spo0 h = 70.000000

Compartment_D spo0 v = 0.001000
Compartment_D spo0 av_visc = 0.001000
Compartment_D spo0 water = 100.000000
Compartment_D spo1 p_s = 101.300003
Compartment_D spo1 h = 70.000000
Compartment_D spo1 v = 0.001000
Compartment_D spo1 av_visc = 0.001000
Compartment_D spo1 water = 100.000000
Compartment_D spo2 p_s = 101.324997
Compartment_D spo2 h = 70.225914
Compartment_D spo2 v = 0.001000
Compartment_D spo2 av_visc = 0.001000
Compartment_D spo2 water = 99.999992
Compartment_D spo3 p_s = 101.300003
Compartment_D spo3 h = 70.000000
Compartment_D spo3 v = 0.001000
Compartment_D spo3 av_visc = 0.001000
Compartment_D spo3 water = 100.000000
Compartment_D spo4 p_s = 101.324997
Compartment_D spo4 h = 70.027069
Compartment_D spo4 v = 0.001000
Compartment_D spo4 av_visc = 0.001000
Compartment_D spo4 water = 99.999977
Compartment_D spo5 lvl_inst = 0.012192
Compartment_D spo6 tmp_inst = 16.747805
Compartment_E r index_max = 9
Compartment_E r nb_out = 10
Compartment_E s leak_cnd = 10.000000
Compartment_E s l_1 = 1.354667
Compartment_E s l_2 = 2.709333
Compartment_E s l_3 = 4.064000
Compartment_E s l_4 = 5.418667
Compartment_E s l_5 = 6.773333
Compartment_E s l_6 = 8.127999
Compartment_E s l_7 = 9.482666
Compartment_E s l_8 = 10.837334
Compartment_E s l_9 = 12.191999
Compartment_E s v_1 = 26.373323
Compartment_E s v_2 = 101.435852
Compartment_E s v_3 = 219.101456
Compartment_E s v_4 = 373.283966
Compartment_E s v_5 = 557.897217
Compartment_E s v_6 = 766.855103
Compartment_E s v_7 = 994.071350
Compartment_E s v_8 = 1233.459961
Compartment_E s v_9 = 1478.934814
Compartment_E s mlf_lvl = 0.100000
Compartment_E s mlf_temp = 25.000000
Compartment_E s h_tk_prv = 104.669998
Compartment_E s h_tk = 104.669998
Compartment_E s l_tk = 0.012192
Compartment_E s m_tk = 237.359879
Compartment_E s t_tk = 25.000000
Compartment_E s m_tk_prv = 237.359879
Compartment_E s vol = 237.359894
Compartment_E s v_tk = 0.237360
Compartment_E s v_tk_prv = 0.237360
Compartment_E s p_tk = 101.444603
Compartment_E s rho_tk = 999.999939
Compartment_E s vspec_tk = 0.001000
Compartment_E s lvl_per = 0.100000
Compartment_E s water_p = 100.000000
Compartment_E s av_visc_tk = 0.001026
Compartment_E s Cp_f3gp_11 = 4.186800
Compartment_E s Cp_f3gp_15 = 4.186800
Compartment_E s Cp_f3gp_25 = 4.186800
Compartment_E s Cp_spare = 4.186800
Compartment_E s v_f3gp_11m = 0.001000
Compartment_E s v_f3gp_15m = 0.001000
Compartment_E s v_f3gp_25m = 0.001000
Compartment_E s v_spare = 0.001000
Compartment_E spi0 p_s = 101.324997
Compartment_E spi0 h = 70.000000
Compartment_E spi0 v = 0.001000
Compartment_E spi0 av_visc = 0.001000
Compartment_E spi0 water = 100.000000
Compartment_E spi1 p_s = 101.324997
Compartment_E spi1 h = 70.000000
Compartment_E spi1 v = 0.001000
Compartment_E spi1 av_visc = 0.001000
Compartment_E spi1 water = 100.000000
Compartment_E spi2 p_s = 101.300003
Compartment_E spi2 h = 70.000000
Compartment_E spi2 v = 0.001000
Compartment_E spi2 av_visc = 0.001000
Compartment_E spi2 water = 100.000000
Compartment_E spi3 p_s = 101.300003
Compartment_E spi3 h = 70.000000
Compartment_E spi3 v = 0.001000
Compartment_E spi3 av_visc = 0.001000
Compartment_E spi3 water = 100.000000
Compartment_E spi4 p_s = 101.300003
Compartment_E spi4 h = 70.000000
Compartment_E spi4 v = 0.001000
Compartment_E spi4 av_visc = 0.001000
Compartment_E spi4 water = 100.000000
Compartment_E spo0 av_visc = 0.001000
Compartment_E spo0 water = 100.000000
Compartment_E spo1 p_s = 101.300003
Compartment_E spo1 h = 70.000000
Compartment_E spo1 v = 0.001000
Compartment_E spo1 av_visc = 0.001000
Compartment_E spo1 water = 100.000000
Compartment_E spo2 p_s = 101.324997
Compartment_E spo2 h = 70.000000
Compartment_E spo2 v = 0.001000
Compartment_E spo2 av_visc = 0.001000
Compartment_E spo2 water = 100.000000
Compartment_E spo3 p_s = 101.300003
Compartment_E spo3 h = 70.000000
Compartment_E spo3 v = 0.001000
Compartment_E spo3 av_visc = 0.001000

Compartment_E spo3 water = 100.000000
Compartment_E spo4 p_s = 101.324997
Compartment_E spo4 h = 70.000000
Compartment_E spo4 v = 0.001000
Compartment_E spo4 av_visc = 0.001000
Compartment_E spo4 water = 100.000000
Compartment_E spo5 lvl_inst = 0.012192
Compartment_E spo6 tmp_inst = 25.000000
Compartment_F r index_max = 9
Compartment_F r nb_out = 10
Compartment_F s leak_cnd = 10.000000
Compartment_F s l_1 = 1.354667
Compartment_F s l_2 = 2.709333
Compartment_F s l_3 = 4.064000
Compartment_F s l_4 = 5.418667
Compartment_F s l_5 = 6.773333
Compartment_F s l_6 = 8.127999
Compartment_F s l_7 = 9.482666
Compartment_F s l_8 = 10.837334
Compartment_F s l_9 = 12.191999
Compartment_F s v_1 = 13.397087
Compartment_F s v_2 = 51.527256
Compartment_F s v_3 = 111.297707
Compartment_F s v_4 = 189.620300
Compartment_F s v_5 = 283.399902
Compartment_F s v_6 = 389.546051
Compartment_F s v_7 = 504.967133
Compartment_F s v_8 = 626.571411
Compartment_F s v_9 = 751.267395
Compartment_F s mlf_lvl = 0.100000
Compartment_F s mlf_temp = 25.000000
Compartment_F s h_tk_prv = 104.669998
Compartment_F s h_tk = 104.669998
Compartment_F s l_tk = 0.012192
Compartment_F s m_tk = 120.573769
Compartment_F s t_tk = 25.000000
Compartment_F s m_tk_prv = 120.573769
Compartment_F s vol = 120.573776
Compartment_F s v_tk = 0.120574
Compartment_F s v_tk_prv = 0.120574
Compartment_F s p_tk = 101.444603
Compartment_F s rho_tk = 999.999939
Compartment_F s vspec_tk = 0.001000
Compartment_F s lvl_per = 0.100000
Compartment_F s water_p = 100.000000
Compartment_F s av_visc_tk = 0.001051
Compartment_F s Cp_f3gp_11 = 4.186800
Compartment_F s Cp_f3gp_15 = 4.186800
Compartment_F s Cp_f3gp_25 = 4.186800
Compartment_F s Cp_spare = 4.186800
Compartment_F s v_f3gp_11m = 0.001000
Compartment_F s v_f3gp_15m = 0.001000
Compartment_F s v_f3gp_25m = 0.001000
Compartment_F s v_spare = 0.001000
Compartment_F spi0 p_s = 101.324997
Compartment_F spi0 h = 70.000000
Compartment_F spi0 v = 0.001000
Compartment_F spi0 av_visc = 0.001000
Compartment_F spi0 water = 100.000000
Compartment_F spi1 p_s = 101.324997
Compartment_F spi1 h = 70.000000
Compartment_F spi1 v = 0.001000
Compartment_F spi1 av_visc = 0.001000
Compartment_F spi1 water = 100.000000
Compartment_F spi2 p_s = 101.300003
Compartment_F spi2 h = 70.000000
Compartment_F spi2 v = 0.001000
Compartment_F spi2 av_visc = 0.001000
Compartment_F spi2 water = 100.000000
Compartment_F spi3 p_s = 101.300003
Compartment_F spi3 h = 70.000000
Compartment_F spi3 v = 0.001000
Compartment_F spi3 av_visc = 0.001000
Compartment_F spi3 water = 100.000000
Compartment_F spi4 p_s = 101.300003
Compartment_F spi4 h = 70.000000
Compartment_F spi4 v = 0.001000
Compartment_F spi4 av_visc = 0.001000
Compartment_F spi4 water = 100.000000
Compartment_F spo0 p_s = 101.300003
Compartment_F spo0 h = 70.000000
Compartment_F spo0 v = 0.001000
Compartment_F spo0 av_visc = 0.001000
Compartment_F spo0 water = 100.000000
Compartment_F spo1 p_s = 101.300003
Compartment_F spo1 h = 70.000000
Compartment_F spo1 v = 0.001000
Compartment_F spo1 av_visc = 0.001000
Compartment_F spo1 water = 100.000000
Compartment_F spo2 p_s = 101.324997
Compartment_F spo2 h = 70.000000
Compartment_F spo2 v = 0.001000
Compartment_F spo2 av_visc = 0.001000
Compartment_F spo2 water = 100.000000
Compartment_F spo3 p_s = 101.300003
Compartment_F spo3 h = 70.000000
Compartment_F spo3 v = 0.001000
Compartment_F spo3 av_visc = 0.001000
Compartment_F spo3 water = 100.000000
Compartment_F spo4 p_s = 101.324997
Compartment_F spo4 h = 70.000000
Compartment_F spo4 v = 0.001000
Compartment_F spo4 av_visc = 0.001000
Compartment_F spo4 water = 100.000000
Compartment_F spo5 lvl_inst = 0.012192
Compartment_F spo6 tmp_inst = 25.000000
Compartment_G r index_max = 9
Compartment_G s leak_cnd = 10.000000
Compartment_G s l_1 = 1.354667
Compartment_G s l_2 = 2.709333
Compartment_G s l_3 = 4.064000
Compartment_G s l_4 = 5.418667

Compartment_G s l_5 = 6.773333
Compartment_G s l_6 = 8.127999
Compartment_G s l_7 = 9.482666
Compartment_G s l_8 = 10.837334
Compartment_G s l_9 = 12.191999
Compartment_G s v_1 = 31.811890
Compartment_G s v_2 = 122.356682
Compartment_G s v_3 = 264.288177
Compartment_G s v_4 = 450.268616
Compartment_G s v_5 = 672.883850
Compartment_G s v_6 = 924.932129
Compartment_G s v_7 = 1199.069946
Compartment_G s v_8 = 1487.651123
Compartment_G s v_9 = 1783.878540
Compartment_G s mlf_lvl = 0.100000
Compartment_G s mlf_temp = 25.000000
Compartment_G s h_tk_prv = 104.669998
Compartment_G s h_tk = 104.669998
Compartment_G s l_tk = 0.012192
Compartment_G s m_tk = 286.306976
Compartment_G s t_tk = 25.000000
Compartment_G s m_tk_prv = 286.306976
Compartment_G s vol = 286.306976
Compartment_G s v_tk = 0.286307
Compartment_G s v_tk_prv = 0.286307
Compartment_G s p_tk = 101.444603
Compartment_G s rho_tk = 999.999939
Compartment_G s vspec_tk = 0.001000
Compartment_G s lvl_per = 0.100000
Compartment_G s water_p = 100.000000
Compartment_G s av_visc_tk = 0.001022
Compartment_G s Cp_f3gp_11 = 4.186800
Compartment_G s Cp_f3gp_15 = 4.186800
Compartment_G s Cp_f3gp_25 = 4.186800
Compartment_G s Cp_spare = 4.186800
Compartment_G s v_f3gp_11m = 0.001000
Compartment_G s v_f3gp_15m = 0.001000
Compartment_G s v_f3gp_25m = 0.001000
Compartment_G s v_spare = 0.001000
Compartment_G spi0 p_s = 101.324997
Compartment_G spi0 h = 70.000000
Compartment_G spi0 v = 0.001000
Compartment_G spi0 av_visc = 0.001000
Compartment_G spi0 water = 100.000000
Compartment_G spi1 p_s = 101.324997
Compartment_G spi1 h = 70.000000
Compartment_G spi1 v = 0.001000
Compartment_G spi1 av_visc = 0.001000
Compartment_G spi1 water = 100.000000
Compartment_G spi2 p_s = 101.300003
Compartment_G spi2 h = 70.000000
Compartment_G spi2 v = 0.001000
Compartment_G spi2 av_visc = 0.001000
Compartment_G spi2 water = 100.000000
Compartment_G spi3 p_s = 101.300003
Compartment_G spi3 h = 70.000000
Compartment_G spi3 v = 0.001000
Compartment_G spi3 av_visc = 0.001000
Compartment_G spi3 water = 100.000000
Compartment_G spi4 p_s = 101.300003
Compartment_G spi4 h = 70.000000
Compartment_G spi4 v = 0.001000
Compartment_G spi4 av_visc = 0.001000
Compartment_G spi4 water = 100.000000
Compartment_G spo0 p_s = 101.300003
Compartment_G spo0 h = 70.000000
Compartment_G spo0 v = 0.001000
Compartment_G spo0 av_visc = 0.001000
Compartment_G spo0 water = 100.000000
Compartment_G spo1 p_s = 101.300003
Compartment_G spo1 h = 70.000000
Compartment_G spo1 v = 0.001000
Compartment_G spo1 av_visc = 0.001000
Compartment_G spo1 water = 100.000000
Compartment_G spo2 p_s = 101.324997
Compartment_G spo2 h = 70.000000
Compartment_G spo2 v = 0.001000
Compartment_G spo2 av_visc = 0.001000
Compartment_G spo2 water = 100.000000
Compartment_G spo3 p_s = 101.300003
Compartment_G spo3 h = 70.000000
Compartment_G spo3 v = 0.001000
Compartment_G spo3 av_visc = 0.001000
Compartment_G spo3 water = 100.000000
Compartment_G spo4 p_s = 101.324997
Compartment_G spo4 h = 70.000000
Compartment_G spo4 v = 0.001000
Compartment_G spo4 av_visc = 0.001000
Compartment_G spo4 water = 100.000000
Compartment_G spo5 lvl_inst = 0.012192
Compartment_G spo6 tmp_inst = 25.000000
Compartment_H r index_max = 9
Compartment_H r nb_out = 10
Compartment_H s leak_cnd = 10.000000
Compartment_H s l_1 = 1.354667
Compartment_H s l_2 = 2.709333
Compartment_H s l_3 = 4.064000
Compartment_H s l_4 = 5.418667
Compartment_H s l_5 = 6.773333
Compartment_H s l_6 = 8.127999
Compartment_H s l_7 = 9.482666
Compartment_H s l_8 = 10.837334
Compartment_H s l_9 = 12.191999
Compartment_H s v_1 = 14.957505
Compartment_H s v_2 = 57.529305
Compartment_H s v_3 = 124.263184
Compartment_H s v_4 = 211.707504
Compartment_H s v_5 = 316.410919
Compartment_H s v_6 = 434.921143
Compartment_H s v_7 = 563.786621
Compartment_H s v_8 = 699.555664
Compartment_H s v_9 = 838.776978

Compartment_H s mlf_lvl = 0.100000
Compartment_H s mlf_temp = 25.000000
Compartment_H s h_tk_prv = 104.669998
Compartment_H s h_tk = 104.669998
Compartment_H s l_tk = 0.012192
Compartment_H s m_tk = 134.617538
Compartment_H s t_tk = 25.000000
Compartment_H s m_tk_prv = 134.617538
Compartment_H s vol = 134.617554
Compartment_H s v_tk = 0.134618
Compartment_H s v_tk_prv = 0.134618
Compartment_H s p_tk = 101.444603
Compartment_H s rho_tk = 999.999939
Compartment_H s vspec_tk = 0.001000
Compartment_H s lvl_per = 0.100000
Compartment_H s water_p = 99.999992
Compartment_H s av_visc_tk = 0.001046
Compartment_H s Cp_f3gp_11 = 4.186800
Compartment_H s Cp_f3gp_15 = 4.186800
Compartment_H s Cp_f3gp_25 = 4.186800
Compartment_H s Cp_spare = 4.186800
Compartment_H s v_f3gp_11m = 0.001000
Compartment_H s v_f3gp_15m = 0.001000
Compartment_H s v_f3gp_25m = 0.001000
Compartment_H s v_spare = 0.001000
Compartment_H spi0 p_s = 101.324997
Compartment_H spi0 h = 70.000000
Compartment_H spi0 v = 0.001000
Compartment_H spi0 av_visc = 0.001000
Compartment_H spi0 water = 100.000000
Compartment_H spi1 p_s = 101.324997
Compartment_H spi1 h = 70.000000
Compartment_H spi1 v = 0.001000
Compartment_H spi1 av_visc = 0.001000
Compartment_H spi1 water = 100.000000
Compartment_H spi2 p_s = 101.300003
Compartment_H spi2 h = 70.000000
Compartment_H spi2 v = 0.001000
Compartment_H spi2 av_visc = 0.001000
Compartment_H spi2 water = 100.000000
Compartment_H spi3 p_s = 101.300003
Compartment_H spi3 h = 70.000000
Compartment_H spi3 v = 0.001000
Compartment_H spi3 av_visc = 0.001000
Compartment_H spi3 water = 100.000000
Compartment_H spi4 p_s = 101.300003
Compartment_H spi4 h = 70.000000
Compartment_H spi4 v = 0.001000
Compartment_H spi4 av_visc = 0.001000
Compartment_H spi4 water = 100.000000
Compartment_H spo0 p_s = 101.300003
Compartment_H spo0 h = 70.000000
Compartment_H spo0 v = 0.001000
Compartment_H spo0 av_visc = 0.001000
Compartment_H spo0 water = 100.000000
Compartment_H spo1 p_s = 101.300003
Compartment_H spo1 h = 70.000000
Compartment_H spo1 v = 0.001000
Compartment_H spo1 av_visc = 0.001000
Compartment_H spo1 water = 100.000000
Compartment_H spo2 p_s = 101.324997
Compartment_H spo2 h = 70.000000
Compartment_H spo2 v = 0.001000
Compartment_H spo2 av_visc = 0.001000
Compartment_H spo2 water = 100.000000
Compartment_H spo3 p_s = 101.300003
Compartment_H spo3 h = 70.000000
Compartment_H spo3 v = 0.001000
Compartment_H spo3 av_visc = 0.001000
Compartment_H spo3 water = 100.000000
Compartment_H spo4 p_s = 101.324997
Compartment_H spo4 h = 70.000000
Compartment_H spo4 v = 0.001000
Compartment_H spo4 av_visc = 0.001000
Compartment_H spo4 water = 100.000000
Compartment_H spo5 lvl_inst = 0.012192
Compartment_H spo6 tmp_inst = 25.000000
Compartment_I r index_max = 9
Compartment_I r nb_out = 10
Compartment_I s leak_cnd = 10.000000
Compartment_I s l_1 = 1.354667
Compartment_I s l_2 = 2.709333
Compartment_I s l_3 = 4.064000
Compartment_I s l_4 = 5.418667
Compartment_I s l_5 = 6.773333
Compartment_I s l_6 = 8.127999
Compartment_I s l_7 = 9.482666
Compartment_I s l_8 = 10.837334
Compartment_I s l_9 = 12.191999
Compartment_I s v_1 = 7.635929
Compartment_I s v_2 = 29.369003
Compartment_I s v_3 = 63.436863
Compartment_I s v_4 = 108.077728
Compartment_I s v_5 = 161.528946
Compartment_I s v_6 = 222.029022
Compartment_I s v_7 = 287.816437
Compartment_I s v_8 = 357.126038
Compartment_I s v_9 = 428.198822
Compartment_I s mlf_lvl = 0.100000
Compartment_I s mlf_temp = 25.000000
Compartment_I s h_tk_prv = 104.669998
Compartment_I s h_tk = 104.669998
Compartment_I s l_tk = 0.012192
Compartment_I s m_tk = 68.723358
Compartment_I s t_tk = 25.000000
Compartment_I s m_tk_prv = 68.723358
Compartment_I s vol = 68.723358
Compartment_I s v_tk = 0.068723
Compartment_I s v_tk_prv = 0.068723
Compartment_I s p_tk = 101.444603
Compartment_I s rho_tk = 999.999939
Compartment_I s vspec_tk = 0.001000

Compartment_I s lvl_per = 0.100000
Compartment_I s water_p = 100.000000
Compartment_I s av_visc_tk = 0.001090
Compartment_I s Cp_f3gp_11 = 4.186800
Compartment_I s Cp_f3gp_15 = 4.186800
Compartment_I s Cp_f3gp_25 = 4.186800
Compartment_I s Cp_spare = 4.186800
Compartment_I s v_f3gp_11m = 0.001000
Compartment_I s v_f3gp_15m = 0.001000
Compartment_I s v_f3gp_25m = 0.001000
Compartment_I s v_spare = 0.001000
Compartment_I spi0 p_s = 101.324997
Compartment_I spi0 h = 70.000000
Compartment_I spi0 v = 0.001000
Compartment_I spi0 av_visc = 0.001000
Compartment_I spi0 water = 100.000000
Compartment_I spi1 p_s = 101.324997
Compartment_I spi1 h = 70.000000
Compartment_I spi1 v = 0.001000
Compartment_I spi1 av_visc = 0.001000
Compartment_I spi1 water = 100.000000
Compartment_I spi2 p_s = 101.300003
Compartment_I spi2 h = 70.000000
Compartment_I spi2 v = 0.001000
Compartment_I spi2 av_visc = 0.001000
Compartment_I spi2 water = 100.000000
Compartment_I spi3 p_s = 101.300003
Compartment_I spi3 h = 70.000000
Compartment_I spi3 v = 0.001000
Compartment_I spi3 av_visc = 0.001000
Compartment_I spi3 water = 100.000000
Compartment_I spi4 p_s = 101.300003
Compartment_I spi4 h = 70.000000
Compartment_I spi4 v = 0.001000
Compartment_I spi4 av_visc = 0.001000
Compartment_I spi4 water = 100.000000
Compartment_I spo0 p_s = 101.300003
Compartment_I spo0 h = 70.000000
Compartment_I spo0 v = 0.001000
Compartment_I spo0 av_visc = 0.001000
Compartment_I spo0 water = 100.000000
Compartment_I spo1 p_s = 101.300003
Compartment_I spo1 h = 70.000000
Compartment_I spo1 v = 0.001000
Compartment_I spo1 av_visc = 0.001000
Compartment_I spo1 water = 100.000000
Compartment_I spo2 p_s = 101.324997
Compartment_I spo2 h = 70.000000
Compartment_I spo2 v = 0.001000
Compartment_I spo2 av_visc = 0.001000
Compartment_I spo2 water = 100.000000
Compartment_I spo3 p_s = 101.300003
Compartment_I spo3 h = 70.000000
Compartment_I spo3 v = 0.001000
Compartment_I spo3 av_visc = 0.001000
Compartment_I spo3 water = 100.000000
Compartment_I spo4 p_s = 101.324997
Compartment_I spo4 h = 70.000000
Compartment_I spo4 v = 0.001000
Compartment_I spo4 av_visc = 0.001000
Compartment_I spo4 water = 100.000000
Compartment_I spo5 lvl_inst = 0.012192
Compartment_I spo6 tmp_inst = 25.000000
Compartment_J r index_max = 9
Compartment_J r nb_out = 10
Compartment_J s leak_cnd = 10.000000
Compartment_J s l_1 = 1.354667
Compartment_J s l_2 = 2.709333
Compartment_J s l_3 = 4.064000
Compartment_J s l_4 = 5.418667
Compartment_J s l_5 = 6.773333
Compartment_J s l_6 = 8.127999
Compartment_J s l_7 = 9.482666
Compartment_J s l_8 = 10.837334
Compartment_J s l_9 = 12.191999
Compartment_J s v_1 = 4.022294
Compartment_J s v_2 = 15.470098
Compartment_J s v_3 = 33.415367
Compartment_J s v_4 = 56.929768
Compartment_J s v_5 = 85.085258
Compartment_J s v_6 = 116.953499
Compartment_J s v_7 = 151.606461
Compartment_J s v_8 = 188.115784
Compartment_J s v_9 = 225.553162
Compartment_J s mlf_lvl = 0.100000
Compartment_J s mlf_temp = 25.000000
Compartment_J s h_tk_prv = 104.669998
Compartment_J s h_tk = 104.669998
Compartment_J s l_tk = 0.012192
Compartment_J s m_tk = 36.200638
Compartment_J s t_tk = 25.000000
Compartment_J s m_tk_prv = 36.200638
Compartment_J s vol = 36.200638
Compartment_J s v_tk = 0.036201
Compartment_J s v_tk_prv = 0.036201
Compartment_J s p_tk = 101.444603
Compartment_J s rho_tk = 999.999939
Compartment_J s vspec_tk = 0.001000
Compartment_J s lvl_per = 0.100000
Compartment_J s water_p = 100.000000
Compartment_J s av_visc_tk = 0.001171
Compartment_J s Cp_f3gp_11 = 4.186800
Compartment_J s Cp_f3gp_15 = 4.186800
Compartment_J s Cp_f3gp_25 = 4.186800
Compartment_J s Cp_spare = 4.186800
Compartment_J s v_f3gp_11m = 0.001000
Compartment_J s v_f3gp_15m = 0.001000
Compartment_J s v_f3gp_25m = 0.001000
Compartment_J s v_spare = 0.001000
Compartment_J spi0 p_s = 101.300003
Compartment_J spi0 h = 70.000000
Compartment_J spi0 v = 0.001000

Compartment_J spi0 av_visc = 0.001000
Compartment_J spi0 water = 100.000000
Compartment_J spi1 p_s = 101.324997
Compartment_J spi1 h = 70.000000
Compartment_J spi1 v = 0.001000
Compartment_J spi1 av_visc = 0.001000
Compartment_J spi1 water = 100.000000
Compartment_J spi2 p_s = 101.300003
Compartment_J spi2 h = 70.000000
Compartment_J spi2 v = 0.001000
Compartment_J spi2 av_visc = 0.001000
Compartment_J spi2 water = 100.000000
Compartment_J spi3 p_s = 101.300003
Compartment_J spi3 h = 70.000000
Compartment_J spi3 v = 0.001000
Compartment_J spi3 av_visc = 0.001000
Compartment_J spi3 water = 100.000000
Compartment_J spi4 p_s = 101.300003
Compartment_J spi4 h = 70.000000
Compartment_J spi4 v = 0.001000
Compartment_J spi4 av_visc = 0.001000
Compartment_J spi4 water = 100.000000
Compartment_J spo0 p_s = 101.300003
Compartment_J spo0 h = 70.000000
Compartment_J spo0 v = 0.001000
Compartment_J spo0 av_visc = 0.001000
Compartment_J spo0 water = 100.000000
Compartment_J spo1 p_s = 101.324997
Compartment_J spo1 h = 70.000000
Compartment_J spo1 v = 0.001000
Compartment_J spo1 av_visc = 0.001000
Compartment_J spo1 water = 100.000000
Compartment_J spo2 p_s = 101.300003
Compartment_J spo2 h = 70.000000
Compartment_J spo2 v = 0.001000
Compartment_J spo2 av_visc = 0.001000
Compartment_J spo2 water = 100.000000
Compartment_J spo3 p_s = 101.300003
Compartment_J spo3 h = 70.000000
Compartment_J spo3 v = 0.001000
Compartment_J spo3 av_visc = 0.001000
Compartment_J spo3 water = 100.000000
Compartment_J spo4 p_s = 101.324997
Compartment_J spo4 h = 70.000000
Compartment_J spo4 v = 0.001000
Compartment_J spo4 av_visc = 0.001000
Compartment_J spo4 water = 100.000000
Compartment_J spo5 lvl_inst = 0.012192
Compartment_J spo6 tmp_inst = 25.000000
Hole_Depth_A-i s p_s = 131.242416
Hole_Depth_A-i s h = 70.000000
Hole_Depth_A-i s v = 0.001000
Hole_Depth_A-i s av_visc = 0.001000
Hole_Depth_A-i s water = 100.000000
Hole_Depth_A-i spo0 p_s = 131.242416
Hole_Depth_A-i spo0 av_visc = 0.001000
Hole_Depth_A-i spo0 water = 100.000000
Hole_Depth_B-i s p_s = 131.242416
Hole_Depth_B-i s h = 70.000000
Hole_Depth_B-i s v = 0.001000
Hole_Depth_B-i s av_visc = 0.001000
Hole_Depth_B-i s water = 100.000000
Hole_Depth_B-i spo0 p_s = 131.242416
Hole_Depth_B-i spo0 h = 70.000000
Hole_Depth_B-i spo0 v = 0.001000
Hole_Depth_B-i spo0 av_visc = 0.001000
Hole_Depth_B-i spo0 water = 100.000000
Hole_Depth_C-i s p_s = 131.242416
Hole_Depth_C-i s h = 70.000000
Hole_Depth_C-i s v = 0.001000
Hole_Depth_C-i s av_visc = 0.001000
Hole_Depth_C-i s water = 100.000000
Hole_Depth_C-i spo0 p_s = 131.242416
Hole_Depth_C-i spo0 h = 70.000000
Hole_Depth_C-i spo0 v = 0.001000
Hole_Depth_C-i spo0 av_visc = 0.001000
Hole_Depth_C-i spo0 water = 100.000000
Hole_Depth_D-i s p_s = 131.242416
Hole_Depth_D-i s h = 70.000000
Hole_Depth_D-i s v = 0.001000
Hole_Depth_D-i s av_visc = 0.001000
Hole_Depth_D-i s water = 100.000000
Hole_Depth_D-i spo0 p_s = 131.242416
Hole_Depth_D-i spo0 h = 70.000000
Hole_Depth_D-i spo0 v = 0.001000
Hole_Depth_D-i spo0 av_visc = 0.001000
Hole_Depth_D-i spo0 water = 100.000000
Hole_Depth_F-i s p_s = 131.242416
Hole_Depth_F-i s h = 70.000000
Hole_Depth_F-i s v = 0.001000
Hole_Depth_F-i s av_visc = 0.001000
Hole_Depth_F-i s water = 100.000000
Hole_Depth_F-i spo0 p_s = 131.242416
Hole_Depth_F-i spo0 h = 70.000000
Hole_Depth_F-i spo0 v = 0.001000
Hole_Depth_F-i spo0 av_visc = 0.001000
Hole_Depth_F-i spo0 water = 100.000000
Hole_Depth_G-i s p_s = 131.242416
Hole_Depth_G-i s h = 70.000000
Hole_Depth_G-i s v = 0.001000
Hole_Depth_G-i s av_visc = 0.001000
Hole_Depth_G-i s water = 100.000000
Hole_Depth_G-i spo0 p_s = 131.242416
Hole_Depth_G-i spo0 h = 70.000000
Hole_Depth_G-i spo0 v = 0.001000
Hole_Depth_G-i spo0 av_visc = 0.001000
Hole_Depth_G-i spo0 water = 100.000000
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Hole_Depth_H-i s h = 70.000000
Hole_Depth_H-i s v = 0.001000
Hole_Depth_H-i s av_visc = 0.001000
Hole_Depth_H-i s water = 100.000000

Hole_Depth_H-i spo0 p_s = 131.242416
Hole_Depth_H-i spo0 h = 70.000000
Hole_Depth_H-i spo0 v = 0.001000
Hole_Depth_H-i spo0 av_visc = 0.001000
Hole_Depth_H-i spo0 water = 100.000000
Hole_Depth_I-i s p_s = 131.242416
Hole_Depth_I-i s h = 70.000000
Hole_Depth_I-i s v = 0.001000
Hole_Depth_I-i s av_visc = 0.001000
Hole_Depth_I-i s water = 100.000000
Hole_Depth_I-i spo0 p_s = 131.242416
Hole_Depth_I-i spo0 h = 70.000000
Hole_Depth_I-i spo0 v = 0.001000
Hole_Depth_I-i spo0 av_visc = 0.001000
Hole_Depth_I-i spo0 water = 100.000000
Hole_Depth_J-i s p_s = 131.242416
Hole_Depth_J-i s h = 70.000000
Hole_Depth_J-i s v = 0.001000
Hole_Depth_J-i s av_visc = 0.001000
Hole_Depth_J-i s water = 100.000000
Hole_Depth_J-i spo0 p_s = 131.242416
Hole_Depth_J-i spo0 h = 70.000000
Hole_Depth_J-i spo0 v = 0.001000
Hole_Depth_J-i spo0 av_visc = 0.001000
Hole_Depth_J-i spo0 water = 100.000000
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Hull_A r mlf_clg = 100
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Hull_A s d_out = 812.801636
Hull_A s l_p = 0.003048
Hull_A s a_in = 0.518872
Hull_A s a_out = 0.518872
Hull_A s m_pipe = 1.581521
Hull_A s k_f = 999999986991104.000000
Hull_A s k_pipe = 0.002400
Hull_A s friction = 0.640000
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Hull_A spo0 v = 0.001000
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Hull_A ss ao_sct = 0.518872
Hull_A ss v_sct = 0.001000
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Hull_A ss sum_k_a2 = 999999986991104.000000
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Hull_B s d_out = 812.801636
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Hull_B s a_out = 0.518872
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Hull_B spi0 v = 0.001000
Hull_B spi0 av_visc = 0.001000
Hull_B spi0 water = 100.000000
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Hull_B spo0 h = 70.000000
Hull_B spo0 v = 0.001000
Hull_B spo0 av_visc = 0.001000
Hull_B spo0 water = 100.000000
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Hull_B sr pump_loc = -1
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Hull_B ss ao_sct = 0.518872
Hull_B ss v_sct = 0.001000
Hull_B ss ad_max = 1.000000
Hull_B ss sum_k = 999999986991104.000000
Hull_B ss sum_k_a2 = 999999986991104.000000
Hull_B ss l_sct = 0.003048
Hull_B ss mu = 0.001000
Hull_B ssp w_max = 100000.000000
Hull_B ssp dp = 29.917419
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Hull_C s m_pipe = 1.581521

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Hull_C s friction = 0.012732
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Hull_C spo0 h = 70.000000
Hull_C spo0 v = 0.001000
Hull_C spo0 av_visc = 0.001000
Hull_C spo0 water = 100.000000
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Hull_C ss v_sct = 0.001000
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Hull_C ss sum_k_a2 = 427.353210
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Hull_D s a_in = 0.518872
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Hull_D s m_pipe = 1.581521
Hull_D s k_f = 999999986991104.000000
Hull_D s k_pipe = 0.002400
Hull_D s friction = 0.640000
Hull_D s Re = 100.000000
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Hull_D spi0 h = 70.000000
Hull_D spi0 v = 0.001000
Hull_D spi0 av_visc = 0.001000
Hull_D spi0 water = 100.000000
Hull_D spo0 p_s = 101.324997
Hull_D spo0 h = 70.000000
Hull_D spo0 v = 0.001000
Hull_D spo0 av_visc = 0.001000
Hull_D spo0 water = 100.000000
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Hull_D sr clg_by_mlf = 1
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Hull_D ss ho_sct = 5.689600
Hull_D ss ai_sct = 0.518872
Hull_D ss ao_sct = 0.518872
Hull_D ss v_sct = 0.001000
Hull_D ss ad_max = 1.000000
Hull_D ss sum_k = 999999986991104.000000
Hull_D ss sum_k_a2 = 999999986991104.000000
Hull_D ss l_sct = 0.003048
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Hull_Depth_E-i s av_visc = 0.001000
Hull_Depth_E-i s water = 100.000000
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Hull_Depth_E-i spo0 h = 70.000000
Hull_Depth_E-i spo0 v = 0.001000
Hull_Depth_E-i spo0 av_visc = 0.001000
Hull_Depth_E-i spo0 water = 100.000000
Hull_E r from_out = 1
Hull_E r mlf_clg = 100
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Hull_E s h_out = 5.689600
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Hull_E s d_out = 812.801636
Hull_E s l_p = 0.003048
Hull_E s a_in = 0.518872
Hull_E s a_out = 0.518872
Hull_E s m_pipe = 1.581521
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Hull_E spi0 v = 0.001000
Hull_E spi0 av_visc = 0.001000
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Hull_E ss sum_k_a2 = 999999986991104.000000
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Hull_F spi0 v = 0.001000
Hull_F spi0 av_visc = 0.001000
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Hull_F ss sum_k_a2 = 999999986991104.000000
Hull_F ss l_sct = 0.003048
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Hull_G s d_out = 812.801636
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Hull_G s a_in = 0.518872
Hull_G s a_out = 0.518872
Hull_G s m_pipe = 1.581521
Hull_G s k_f = 999999986991104.000000
Hull_G s k_pipe = 0.002400
Hull_G s friction = 0.640000
Hull_G s Re = 100.000000
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Hull_G spi0 v = 0.001000
Hull_G spi0 av_visc = 0.001000
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Hull_G spo0 h = 70.000000
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Hull_G ss sum_k_a2 = 999999986991104.000000
Hull_G ss l_sct = 0.003048
Hull_G ss mu = 0.001000
Hull_G ssp w_max = 100000.000000
Hull_G ssp dp = 29.917419
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Hull_H s h_out = 5.689600
Hull_H s d_in = 812.801636
Hull_H s d_out = 812.801636
Hull_H s l_p = 0.003048
Hull_H s a_in = 0.518872
Hull_H s a_out = 0.518872
Hull_H s m_pipe = 1.581521
Hull_H s k_f = 999999986991104.000000
Hull_H s k_pipe = 0.002400
Hull_H s friction = 0.640000
Hull_H s Re = 100.000000
Hull_H spi0 p_s = 131.242416
Hull_H spi0 h = 70.000000
Hull_H spi0 v = 0.001000
Hull_H spi0 av_visc = 0.001000
Hull_H spi0 water = 100.000000
Hull_H spo0 p_s = 101.324997
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Hull_H spo0 v = 0.001000
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Hull_H ss sum_k_a2 = 999999986991104.000000
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Hull_Hole_1 r from_in = 1
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Hull_Hole_1 s h_out = 5.690616
Hull_Hole_1 s d_in = 812.801636
Hull_Hole_1 s d_out = 812.801636
Hull_Hole_1 s d_orif = 304.800598
Hull_Hole_1 s beta = 0.375000
Hull_Hole_1 s a_o = 0.072966
Hull_Hole_1 s a_in = 0.518872
Hull_Hole_1 s a_out = 0.518872
Hull_Hole_1 s mean_a_o = 0.518872
Hull_Hole_1 s d_c = 0.608469
Hull_Hole_1 s k_f = 115.055374
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Hull_Hole_1 spi0 h = 70.000000
Hull_Hole_1 spi0 v = 0.001000
Hull_Hole_1 spi0 av_visc = 0.001000
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Hull_Hole_1 spo0 h = 70.000000
Hull_Hole_1 spo0 v = 0.001000
Hull_Hole_1 spo0 av_visc = 0.001000
Hull_Hole_1 spo0 water = 100.000000
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Hull_Hole_2 s h_out = 5.690616
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Hull_Hole_2 s d_out = 812.801636
Hull_Hole_2 s d_orif = 304.800598
Hull_Hole_2 s beta = 0.375000
Hull_Hole_2 s a_o = 0.072966
Hull_Hole_2 s a_in = 0.518872
Hull_Hole_2 s a_out = 0.518872
Hull_Hole_2 s mean_a_o = 0.518872
Hull_Hole_2 s d_c = 0.608469
Hull_Hole_2 s k_f = 115.055374
Hull_Hole_2 s spd_limit = 50.000000
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Hull_Hole_2 spi0 h = 70.000000
Hull_Hole_2 spi0 v = 0.001000
Hull_Hole_2 spi0 av_visc = 0.001000
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Hull_Hole_2 spo0 v = 0.001000
Hull_Hole_2 spo0 av_visc = 0.001000
Hull_Hole_2 spo0 water = 100.000000
Hull_Hole_3 r from_in = 1
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Hull_Hole_3 s h_out = 5.690616
Hull_Hole_3 s d_in = 812.801636
Hull_Hole_3 s d_out = 812.801636
Hull_Hole_3 s d_orif = 304.800598
Hull_Hole_3 s beta = 0.375000
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Hull_Hole_3 s a_in = 0.518872
Hull_Hole_3 s a_out = 0.518872
Hull_Hole_3 s mean_a_o = 0.518872
Hull_Hole_3 s d_c = 0.608469
Hull_Hole_3 s k_f = 115.055374
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Hull_Hole_3 spi0 v = 0.001000
Hull_Hole_3 spi0 av_visc = 0.001000
Hull_Hole_3 spi0 water = 100.000000
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Hull_Hole_3 spo0 v = 0.001000
Hull_Hole_3 spo0 av_visc = 0.001000
Hull_Hole_3 spo0 water = 100.000000
Hull_Hole_A r from_in = 1
Hull_Hole_A s h_in = 5.689600
Hull_Hole_A s h_out = 5.689600
Hull_Hole_A s d_in = 812.801636
Hull_Hole_A s d_out = 812.801636
Hull_Hole_A s d_orif = 304.800598
Hull_Hole_A s beta = 0.375000
Hull_Hole_A s a_o = 0.072966
Hull_Hole_A s a_in = 0.518872
Hull_Hole_A s a_out = 0.518872
Hull_Hole_A s mean_a_o = 0.518872
Hull_Hole_A s d_c = 0.608469
Hull_Hole_A s k_f = 115.055374
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Hull_Hole_A spi0 av_visc = 0.001000
Hull_Hole_A spi0 water = 100.000000
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Hull_Hole_A spo0 v = 0.001000
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Hull_Hole_A spo0 water = 100.000000
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Hull_Hole_B s h_out = 5.689600
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Hull_Hole_B s d_out = 812.801636
Hull_Hole_B s d_orif = 304.800598
Hull_Hole_B s beta = 0.375000
Hull_Hole_B s a_o = 0.072966
Hull_Hole_B s a_in = 0.518872
Hull_Hole_B s a_out = 0.518872
Hull_Hole_B s mean_a_o = 0.518872
Hull_Hole_B s d_c = 0.608469
Hull_Hole_B s k_f = 115.055374
Hull_Hole_B s spd_limit = 50.000000
Hull_Hole_B spi0 p_s = 131.242416
Hull_Hole_B spi0 h = 70.000000
Hull_Hole_B spi0 v = 0.001000
Hull_Hole_B spi0 av_visc = 0.001000
Hull_Hole_B spi0 water = 100.000000
Hull_Hole_B spo0 p_s = 131.242416
Hull_Hole_B spo0 h = 70.000000
Hull_Hole_B spo0 v = 0.001000
Hull_Hole_B spo0 av_visc = 0.001000
Hull_Hole_B spo0 water = 100.000000
Hull_Hole_E r from_in = 1
Hull_Hole_E s h_in = 5.689600
Hull_Hole_E s h_out = 5.689600
Hull_Hole_E s d_in = 812.801636
Hull_Hole_E s d_out = 812.801636
Hull_Hole_E s d_orif = 304.800598
Hull_Hole_E s beta = 0.375000
Hull_Hole_E s a_o = 0.072966
Hull_Hole_E s a_in = 0.518872
Hull_Hole_E s a_out = 0.518872
Hull_Hole_E s mean_a_o = 0.518872
Hull_Hole_E s d_c = 0.608469
Hull_Hole_E s k_f = 115.055374
Hull_Hole_E s spd_limit = 50.000000
Hull_Hole_E spi0 p_s = 131.242416
Hull_Hole_E spi0 h = 70.000000
Hull_Hole_E spi0 v = 0.001000
Hull_Hole_E spi0 av_visc = 0.001000
Hull_Hole_E spi0 water = 100.000000
Hull_Hole_E spo0 p_s = 131.242416
Hull_Hole_E spo0 h = 70.000000
Hull_Hole_E spo0 v = 0.001000
Hull_Hole_E spo0 av_visc = 0.001000
Hull_Hole_E spo0 water = 100.000000
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Hull_Hole_G s h_in = 5.689600
Hull_Hole_G s h_out = 5.689600
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Hull_Hole_G s d_out = 812.801636
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Hull_Hole_G s beta = 0.375000
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Hull_Hole_G s a_out = 0.518872
Hull_Hole_G s mean_a_o = 0.518872
Hull_Hole_G s d_c = 0.608469
Hull_Hole_G s k_f = 115.055374
Hull_Hole_G s spd_limit = 50.000000
Hull_Hole_G spi0 p_s = 131.242416
Hull_Hole_G spi0 h = 70.000000
Hull_Hole_G spi0 v = 0.001000
Hull_Hole_G spi0 av_visc = 0.001000
Hull_Hole_G spi0 water = 100.000000
Hull_Hole_G spo0 p_s = 131.242416
Hull_Hole_G spo0 h = 70.000000
Hull_Hole_G spo0 v = 0.001000
Hull_Hole_G spo0 av_visc = 0.001000
Hull_Hole_G spo0 water = 100.000000
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Hull_Hole_H s h_in = 5.689600
Hull_Hole_H s h_out = 5.689600
Hull_Hole_H s d_in = 812.801636
Hull_Hole_H s d_out = 812.801636
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Hull_Hole_H s beta = 0.375000
Hull_Hole_H s a_o = 0.072966
Hull_Hole_H s a_in = 0.518872
Hull_Hole_H s a_out = 0.518872
Hull_Hole_H s mean_a_o = 0.518872
Hull_Hole_H s d_c = 0.608469
Hull_Hole_H s k_f = 115.055374
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Hull_Hole_H spi0 h = 70.000000
Hull_Hole_H spi0 v = 0.001000
Hull_Hole_H spi0 av_visc = 0.001000
Hull_Hole_H spi0 water = 100.000000
Hull_Hole_H spo0 p_s = 131.242416
Hull_Hole_H spo0 h = 70.000000
Hull_Hole_H spo0 v = 0.001000
Hull_Hole_H spo0 av_visc = 0.001000
Hull_Hole_H spo0 water = 100.000000
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Hull_Hole_I s h_in = 5.689600
Hull_Hole_I s h_out = 5.689600
Hull_Hole_I s d_in = 812.801636
Hull_Hole_I s d_out = 812.801636
Hull_Hole_I s d_orif = 304.800598
Hull_Hole_I s beta = 0.375000
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Hull_Hole_I s a_in = 0.518872
Hull_Hole_I s a_out = 0.518872
Hull_Hole_I s mean_a_o = 0.518872
Hull_Hole_I s d_c = 0.608469
Hull_Hole_I s k_f = 115.055374
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Hull_Hole_I spi0 p_s = 131.242416
Hull_Hole_I spi0 h = 70.000000
Hull_Hole_I spi0 v = 0.001000
Hull_Hole_I spi0 av_visc = 0.001000

Hull_Hole_I spi0 water = 100.000000
Hull_Hole_I spo0 p_s = 131.242416
Hull_Hole_I spo0 h = 70.000000
Hull_Hole_I spo0 v = 0.001000
Hull_Hole_I spo0 av_visc = 0.001000
Hull_Hole_I spo0 water = 100.000000
Hull_Hole_J r from_in = 1
Hull_Hole_J s h_in = 5.689600
Hull_Hole_J s h_out = 5.689600
Hull_Hole_J s d_in = 812.801636
Hull_Hole_J s d_out = 812.801636
Hull_Hole_J s d_orif = 304.800598
Hull_Hole_J s beta = 0.375000
Hull_Hole_J s a_o = 0.072966
Hull_Hole_J s a_in = 0.518872
Hull_Hole_J s a_out = 0.518872
Hull_Hole_J s mean_a_o = 0.518872
Hull_Hole_J s d_c = 0.608469
Hull_Hole_J s k_f = 115.055374
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Hull_Hole_J spi0 h = 70.000000
Hull_Hole_J spi0 v = 0.001000
Hull_Hole_J spi0 av_visc = 0.001000
Hull_Hole_J spi0 water = 100.000000
Hull_Hole_J spo0 p_s = 131.242416
Hull_Hole_J spo0 h = 70.000000
Hull_Hole_J spo0 v = 0.001000
Hull_Hole_J spo0 av_visc = 0.001000
Hull_Hole_J spo0 water = 100.000000
Hull_I r from_out = 1
Hull_I r mlf_clg = 100
Hull_I s h_in = 5.689600
Hull_I s h_out = 5.689600
Hull_I s d_in = 812.801636
Hull_I s d_out = 812.801636
Hull_I s l_p = 0.003048
Hull_I s a_in = 0.518872
Hull_I s a_out = 0.518872
Hull_I s m_pipe = 1.581521
Hull_I s k_f = 999999986991104.000000
Hull_I s k_pipe = 0.002400
Hull_I s friction = 0.640000
Hull_I s Re = 100.000000
Hull_I spi0 p_s = 131.242416
Hull_I spi0 h = 70.000000
Hull_I spi0 v = 0.001000
Hull_I spi0 av_visc = 0.001000
Hull_I spi0 water = 100.000000
Hull_I spo0 p_s = 101.324997
Hull_I spo0 h = 70.000000
Hull_I spo0 v = 0.001000
Hull_I spo0 av_visc = 0.001000
Hull_I spo0 water = 100.000000
Hull_I sr order = 1
Hull_I sr clg_by_mlf = 1
Hull_I sr pump_loc = -1
Hull_I ss hi_sct = 5.689600
Hull_I ss ho_sct = 5.689600
Hull_I ss ai_sct = 0.518872
Hull_I ss ao_sct = 0.518872
Hull_I ss v_sct = 0.001000
Hull_I ss ad_max = 1.000000
Hull_I ss sum_k = 999999986991104.000000
Hull_I ss sum_k_a2 = 999999986991104.000000
Hull_I ss l_sct = 0.003048
Hull_I ss mu = 0.001000
Hull_I ssp w_max = 100000.000000
Hull_I ssp dp = 29.917419
Hull_J r from_out = 1
Hull_J r mlf_clg = 100
Hull_J s h_in = 5.689600
Hull_J s h_out = 5.689600
Hull_J s d_in = 812.801636
Hull_J s d_out = 812.801636
Hull_J s l_p = 0.003048
Hull_J s a_in = 0.518872
Hull_J s a_out = 0.518872
Hull_J s m_pipe = 1.581521
Hull_J s k_f = 999999986991104.000000
Hull_J s k_pipe = 0.002400
Hull_J s friction = 0.640000
Hull_J s Re = 100.000000
Hull_J spi0 p_s = 131.242416
Hull_J spi0 h = 70.000000
Hull_J spi0 v = 0.001000
Hull_J spi0 av_visc = 0.001000
Hull_J spi0 water = 100.000000
Hull_J spo0 p_s = 101.324997
Hull_J spo0 h = 70.000000
Hull_J spo0 v = 0.001000
Hull_J spo0 av_visc = 0.001000
Hull_J spo0 water = 100.000000
Hull_J sr order = 1
Hull_J sr clg_by_mlf = 1
Hull_J sr pump_loc = -1
Hull_J ss hi_sct = 5.689600
Hull_J ss ho_sct = 5.689600
Hull_J ss ai_sct = 0.518872
Hull_J ss ao_sct = 0.518872
Hull_J ss v_sct = 0.001000
Hull_J ss ad_max = 1.000000
Hull_J ss sum_k = 999999986991104.000000
Hull_J ss sum_k_a2 = 999999986991104.000000
Hull_J ss l_sct = 0.003048
Hull_J ss mu = 0.001000
Hull_J ssp w_max = 100000.000000
Hull_J ssp dp = 29.917419
Main_B s h_in = 0.304800
Main_B s h_out = 0.304800
Main_B s d_in = 151.892303
Main_B s d_out = 151.892303

Main_B s l_p = 3.048000
Main_B s a_in = 0.018120
Main_B s a_out = 0.018120
Main_B s m_pipe = 55.230301
Main_B s k_pipe = 0.859833
Main_B s time_flow = 139.624161
Main_B s friction = 0.042848
Main_B s Re = 3315.660400
Main_B s epsilon = 0.001500
Main_B spi0 p_s = -293.217926
Main_B spi0 h = 70.010262
Main_B spi0 v = 0.001000
Main_B spi0 av_visc = 0.001000
Main_B spi0 water = 99.999977
Main_B spo0 p_s = -293.663116
Main_B spo0 h = 70.010735
Main_B spo0 v = 0.001000
Main_B spo0 av_visc = 0.001000
Main_B spo0 water = 99.999977
Main_B sr order = 1
Main_B sr clg_flag = -1
Main_B sr pump_loc = -1
Main_B ss hi_sct = 0.304800
Main_B ss ho_sct = 0.304800
Main_B ss ai_sct = 0.018120
Main_B ss ao_sct = 0.018120
Main_B ss v_sct = 0.001000
Main_B ss ad_max = 1.000000
Main_B ss sum_k = 1.159328
Main_B ss sum_k_a2 = 3530.869385
Main_B ss l_sct = 3.048000
Main_B ss mu = 0.001000
Main_B ssp w = 2.231064
Main_B ssp w_max = 100000.000000
Main_B ssp ad = 5.011483
Main_B ssp cd = 0.676155
Main_B ssp dp = 0.445190
Main_B ssp Q = 133.863831
Main_BA r num_90 = 1
Main_BA r from_out = 1
Main_BA s h_in = 0.304800
Main_BA s h_out = 0.304800
Main_BA s d_in = 151.892303
Main_BA s d_out = 151.892303
Main_BA s l_p = 9.144000
Main_BA s a_in = 0.018120
Main_BA s a_out = 0.018120
Main_BA s m_pipe = 165.690887
Main_BA s k_f = 19.199999
Main_BA s k_pipe = 38.528351
Main_BA s friction = 0.640000
Main_BA s Re = 100.000000
Main_BA s epsilon = 0.001500
Main_BA spi0 p_s = 96.345711
Main_BA spi0 h = 70.000000
Main_BA spi0 v = 0.001000
Main_BA spi0 av_visc = 0.001000
Main_BA spi0 water = 100.000000
Main_BA spo0 p_s = -293.663116
Main_BA spo0 h = 70.000000
Main_BA spo0 v = 0.001000
Main_BA spo0 av_visc = 0.001000
Main_BA spo0 water = 100.000000
Main_BA sr empty2 = 1
Main_BA sr order = 1
Main_BA sr clg_flag = 3
Main_BA sr pump_loc = -1
Main_BA ss hi_sct = 0.304800
Main_BA ss ho_sct = 0.304800
Main_BA ss ai_sct = 0.018120
Main_BA ss ao_sct = 0.018120
Main_BA ss v_sct = 0.001000
Main_BA ss ad_max = 1.000000
Main_BA ss sum_k = 999999986991104.000000
Main_BA ss sum_k_a2 =
999999986991104.000000
Main_BA ss l_sct = 12.191999
Main_BA ss mu = 0.001000
Main_BA ssp w_max = 100000.000000
Main_BA ssp dp = 394.988098
Main_CB s h_in = 0.304800
Main_CB s h_out = 0.304800
Main_CB s d_in = 151.892303
Main_CB s d_out = 151.892303
Main_CB s l_p = 9.144000
Main_CB s a_in = 0.018120
Main_CB s a_out = 0.018120
Main_CB s m_pipe = 165.690918
Main_CB s k_pipe = 2.097635
Main_CB s time_flow = 209.435608
Main_CB s friction = 0.034844
Main_CB s Re = 6631.353027
Main_CB s epsilon = 0.001500
Main_CB spi0 p_s = -293.217926
Main_CB spi0 h = 70.010262
Main_CB spi0 v = 0.001000
Main_CB spi0 av_visc = 0.001000
Main_CB spi0 water = 99.999977
Main_CB spo0 p_s = -293.021118
Main_CB spo0 h = 70.009270
Main_CB spo0 v = 0.001000
Main_CB spo0 av_visc = 0.001000
Main_CB spo0 water = 99.999985
Main_CB sr clg_flag = -1
Main_CB sr pump_loc = -1
Main_CB ss hi_sct = 0.304800
Main_CB ss ho_sct = 0.304800
Main_CB ss ai_sct = 0.018120
Main_CB ss ao_sct = 0.018120
Main_CB ss v_sct = 0.001000
Main_CB ss ad_max = 1.000000
Main_CB ss sum_k = 2.397130

Main_CB ss sum_k_a2 = 7300.738281
Main_CB ss l_sct = 9.144000
Main_CB ss mu = 0.001000
Main_CB ssp w = -1.841438
Main_CB ssp w_max = 100000.000000
Main_CB ssp ad = 9.356528
Main_CB ssp cd = 2.581556
Main_CB ssp dp = -0.196808
Main_CB ssp Q = -110.486290
Main_D s h_in = 0.304800
Main_D s h_out = 0.304800
Main_D s d_in = 151.892303
Main_D s d_out = 151.892303
Main_D s l_p = 3.048000
Main_D s a_in = 0.018120
Main_D s a_out = 0.018120
Main_D s m_pipe = 55.230301
Main_D s k_pipe = 0.480160
Main_D s time_flow = 16.870485
Main_D s friction = 0.023928
Main_D s Re = 27441.195313
Main_D s epsilon = 0.001500
Main_D spi0 p_s = -292.905060
Main_D spi0 h = 70.010269
Main_D spi0 v = 0.001000
Main_D spi0 av_visc = 0.001000
Main_D spi0 water = 99.999985
Main_D spo0 p_s = -292.537598
Main_D spo0 h = 70.010727
Main_D spo0 v = 0.001000
Main_D spo0 av_visc = 0.001000
Main_D spo0 water = 99.999977
Main_D sr order = 1
Main_D sr clg_flag = -1
Main_D sr pump_loc = -1
Main_D ss hi_sct = 0.304800
Main_D ss ho_sct = 0.304800
Main_D ss ai_sct = 0.018120
Main_D ss ao_sct = 0.018120
Main_D ss v_sct = 0.001000
Main_D ss ad_max = 1.000000
Main_D ss sum_k = 0.779656
Main_D ss sum_k_a2 = 2374.532715
Main_D ss l_sct = 3.048000
Main_D ss mu = 0.001000
Main_D ssp w = -3.821185
Main_D ssp w_max = 100000.000000
Main_D ssp ad = 10.398853
Main_D ssp cd = 8.450093
Main_D ssp dp = -0.367462
Main_D ssp Q = -229.271088
Main_DC s h_in = 0.304800
Main_DC s h_out = 0.304800
Main_DC s d_in = 151.892303
Main_DC s d_out = 151.892303
Main_DC s l_p = 9.144000
Main_DC s a_in = 0.018120
Main_DC s a_out = 0.018120
Main_DC s m_pipe = 165.690918
Main_DC s k_pipe = 1.401781
Main_DC s time_flow = 45.162556
Main_DC s friction = 0.023285
Main_DC s Re = 30752.058594
Main_DC s epsilon = 0.001500
Main_DC spi0 p_s = -293.021118
Main_DC spi0 h = 70.009270
Main_DC spi0 v = 0.001000
Main_DC spi0 av_visc = 0.001000
Main_DC spi0 water = 99.999985
Main_DC spo0 p_s = -292.905060
Main_DC spo0 h = 70.010277
Main_DC spo0 v = 0.001000
Main_DC spo0 av_visc = 0.001000
Main_DC spo0 water = 99.999985
Main_DC sr order = 1
Main_DC sr clg_flag = -1
Main_DC sr pump_loc = -1
Main_DC ss hi_sct = 0.304800
Main_DC ss ho_sct = 0.304800
Main_DC ss ai_sct = 0.018120
Main_DC ss ao_sct = 0.018120
Main_DC ss v_sct = 0.001000
Main_DC ss ad_max = 1.000000
Main_DC ss sum_k = 1.701276
Main_DC ss sum_k_a2 = 5181.433594
Main_DC ss l_sct = 9.144000
Main_DC ss mu = 0.001000
Main_DC ssp w = -1.451643
Main_DC ssp w_max = 100000.000000
Main_DC ssp ad = 12.507873
Main_DC ssp cd = 7.290377
Main_DC ssp dp = -0.116058
Main_DC ssp Q = -87.098572
Main_E s h_in = 0.304800
Main_E s h_out = 0.304800
Main_E s d_in = 151.892303
Main_E s d_out = 151.892303
Main_E s l_p = 3.048000
Main_E s a_in = 0.018120
Main_E s a_out = 0.018120
Main_E s m_pipe = 55.230301
Main_E s k_pipe = 0.512118
Main_E s time_flow = 21.950468
Main_E s friction = 0.025521
Main_E s Re = 21090.478516
Main_E s epsilon = 0.001500
Main_E spi0 p_s = -291.616547
Main_E spi0 h = 70.011818
Main_E spi0 v = 0.001000
Main_E spi0 av_visc = 0.001000
Main_E spi0 water = 99.999977
Main_E spo0 p_s = -291.319153

Main_E spo0 h = 70.026382
Main_E spo0 v = 0.001000
Main_E spo0 av_visc = 0.001000
Main_E spo0 water = 99.999985
Main_E sr order = 1
Main_E sr clg_flag = -1
Main_E sr pump_loc = -1
Main_E ss hi_sct = 0.304800
Main_E ss ho_sct = 0.304800
Main_E ss ai_sct = 0.018120
Main_E ss ao_sct = 0.018120
Main_E ss v_sct = 0.001000
Main_E ss ad_max = 1.000000
Main_E ss sum_k = 0.811614
Main_E ss sum_k_a2 = 2471.864014
Main_E ss l_sct = 3.048000
Main_E ss mu = 0.001000
Main_E ssp w = -3.047368
Main_E ssp w_max = 100000.000000
Main_E ssp ad = 10.246910
Main_E ssp cd = 7.486439
Main_E ssp dp = -0.297394
Main_E ssp Q = -182.842041
Main_ED s h_in = 0.304800
Main_ED s h_out = 0.304800
Main_ED s d_in = 151.892303
Main_ED s d_out = 151.892303
Main_ED s l_p = 9.144000
Main_ED s a_in = 0.018120
Main_ED s a_out = 0.018120
Main_ED s m_pipe = 165.690918
Main_ED s time_flow = 57.392921
Main_ED s friction = 0.024669
Main_ED s Re = 24198.763672
Main_ED s epsilon = 0.001500
Main_ED spi0 p_s = -292.537598
Main_ED spi0 h = 70.010727
Main_ED spi0 v = 0.001000
Main_ED spi0 av_visc = 0.001000
Main_ED spi0 water = 99.999977
Main_ED spo0 p_s = -291.616547
Main_ED spo0 h = 70.011818
Main_ED spo0 v = 0.001000
Main_ED spo0 av_visc = 0.001000
Main_ED spo0 water = 99.999977
Main_ED sr order = 1
Main_ED sr clg_flag = -1
Main_ED sr pump_loc = -1
Main_ED ss hi_sct = 0.304800
Main_ED ss ho_sct = 0.304800
Main_ED ss ai_sct = 0.018120
Main_ED ss ao_sct = 0.018120
Main_ED ss v_sct = 0.001000
Main_ED ss ad_max = 1.000000
Main_ED ss sum_k = 1.784610
Main_ED ss sum_k_a2 = 5435.236328
Main_ED ss l_sct = 9.144000
Main_ED ss mu = 0.001000
Main_ED ssp w = -3.433045
Main_ED ssp w_max = 100000.000000
Main_ED ssp ad = 3.727313
Main_ED ssp cd = 4.641545
Main_ED ssp dp = -0.921051
Main_ED ssp Q = -205.982712
Main_F s h_in = 0.304800
Main_F s h_out = 0.304800
Main_F s d_in = 151.892303
Main_F s d_out = 151.892303
Main_F s l_p = 3.048000
Main_F s a_in = 0.018120
Main_F s a_out = 0.018120
Main_F s m_pipe = 55.230301
Main_F s k_pipe = 0.556989
Main_F s time_flow = 30.542418
Main_F s friction = 0.027757
Main_F s Re = 15157.785156
Main_F s epsilon = 0.001500
Main_F spi0 p_s = -290.709442
Main_F spi0 h = 70.027077
Main_F spi0 v = 0.001000
Main_F spi0 av_visc = 0.001000
Main_F spi0 water = 99.999969
Main_F spo0 p_s = -290.486145
Main_F spo0 h = 70.027077
Main_F spo0 v = 0.001000
Main_F spo0 av_visc = 0.001000
Main_F spo0 water = 99.999977
Main_F sr order = 1
Main_F sr clg_flag = -1
Main_F sr pump_loc = -1
Main_F ss hi_sct = 0.304800
Main_F ss ho_sct = 0.304800
Main_F ss ai_sct = 0.018120
Main_F ss ao_sct = 0.018120
Main_F ss v_sct = 0.001000
Main_F ss ad_max = 1.000000
Main_F ss sum_k = 0.856485
Main_F ss sum_k_a2 = 2608.524658
Main_F ss l_sct = 3.048000
Main_F ss mu = 0.001000
Main_F ssp w = -2.279579
Main_F ssp w_max = 100000.000000
Main_F ssp ad = 10.208725
Main_F ssp cd = 6.412834
Main_F ssp dp = -0.223297
Main_F ssp Q = -136.774719
Main_FE r num_45 = 0
Main_FE s h_in = 0.304800
Main_FE s h_out = 0.304800
Main_FE s d_in = 151.892303
Main_FE s d_out = 151.892303
Main_FE s l_p = 7.620000

Main_FE s a_in = 0.018120
Main_FE s a_out = 0.018120
Main_FE s m_pipe = 138.075760
Main_FE s k_pipe = 1.331210
Main_FE s time_flow = 64.085999
Main_FE s friction = 0.026535
Main_FE s Re = 18059.927734
Main_FE s epsilon = 0.001500
Main_FE spi0 p_s = -291.319153
Main_FE spi0 h = 70.026382
Main_FE spi0 v = 0.001000
Main_FE spi0 av_visc = 0.001000
Main_FE spi0 water = 99.999985
Main_FE spo0 p_s = -290.709442
Main_FE spo0 h = 70.027077
Main_FE spo0 v = 0.001000
Main_FE spo0 av_visc = 0.001000
Main_FE spo0 water = 99.999969
Main_FE sr order = 1
Main_FE sr clg_flag = -1
Main_FE sr pump_loc = -1
Main_FE ss hi_sct = 0.304800
Main_FE ss ho_sct = 0.304800
Main_FE ss ai_sct = 0.018120
Main_FE ss ao_sct = 0.018120
Main_FE ss v_sct = 0.001000
Main_FE ss ad_max = 1.000000
Main_FE ss sum_k = 1.630705
Main_FE ss sum_k_a2 = 4966.501465
Main_FE ss l_sct = 7.620000
Main_FE ss mu = 0.001000
Main_FE ssp w = -2.662910
Main_FE ssp w_max = 100000.000000
Main_FE ssp ad = 4.367497
Main_FE ssp cd = 4.418777
Main_FE ssp dp = -0.609711
Main_FE ssp Q = -159.774567
Main_G s h_in = 0.304800
Main_G s h_out = 0.304800
Main_G s d_in = 151.892303
Main_G s d_out = 151.892303
Main_G s l_p = 6.096000
Main_G s a_in = 0.018120
Main_G s a_out = 0.018120
Main_G s m_pipe = 110.460602
Main_G s k_pipe = 1.256818
Main_G s time_flow = 95.839989
Main_G s friction = 0.031316
Main_G s Re = 9661.006836
Main_G s epsilon = 0.001500
Main_G spi0 p_s = -289.885223
Main_G spi0 h = 70.027077
Main_G spi0 v = 0.001000
Main_G spi0 av_visc = 0.001000
Main_G spi0 water = 99.999969
Main_G spo0 p_s = -289.602631
Main_G spo0 h = 70.027077
Main_G spo0 v = 0.001000
Main_G spo0 av_visc = 0.001000
Main_G spo0 water = 99.999969
Main_G sr order = 1
Main_G sr clg_flag = -1
Main_G sr pump_loc = -1
Main_G ss hi_sct = 0.304800
Main_G ss ho_sct = 0.304800
Main_G ss ai_sct = 0.018120
Main_G ss ao_sct = 0.018120
Main_G ss v_sct = 0.001000
Main_G ss ad_max = 1.000000
Main_G ss sum_k = 1.556313
Main_G ss sum_k_a2 = 4739.932129
Main_G ss l_sct = 6.096000
Main_G ss mu = 0.001000
Main_G ssp w = -1.516535
Main_G ssp w_max = 100000.000000
Main_G ssp ad = 5.366503
Main_G ssp cd = 3.652541
Main_G ssp dp = -0.282593
Main_G ssp Q = -90.992088
Main_GF s h_in = 0.304800
Main_GF s h_out = 0.304800
Main_GF s d_in = 151.892303
Main_GF s d_out = 151.892303
Main_GF s l_p = 10.668000
Main_GF s a_in = 0.018120
Main_GF s a_out = 0.018120
Main_GF s m_pipe = 193.306061
Main_GF s k_pipe = 2.058228
Main_GF s time_flow = 131.366104
Main_GF s friction = 0.029305
Main_GF s Re = 12334.566406
Main_GF s epsilon = 0.001500
Main_GF spi0 p_s = -290.486145
Main_GF spi0 h = 70.027077
Main_GF spi0 v = 0.001000
Main_GF spi0 av_visc = 0.001000
Main_GF spi0 water = 99.999977
Main_GF spo0 p_s = -289.885223
Main_GF spo0 h = 70.027077
Main_GF spo0 v = 0.001000
Main_GF spo0 av_visc = 0.001000
Main_GF spo0 water = 99.999969
Main_GF sr order = 1
Main_GF sr clg_flag = -1
Main_GF sr pump_loc = -1
Main_GF ss hi_sct = 0.304800
Main_GF ss ho_sct = 0.304800
Main_GF ss ai_sct = 0.018120
Main_GF ss ao_sct = 0.018120
Main_GF ss v_sct = 0.001000
Main_GF ss ad_max = 1.000000
Main_GF ss sum_k = 2.357724

Main_GF ss sum_k_a2 = 7180.721680
Main_GF ss l_sct = 10.668000
Main_GF ss mu = 0.001000
Main_GF ssp w = -1.897424
Main_GF ssp w_max = 100000.000000
Main_GF ssp ad = 3.157522
Main_GF ssp cd = 3.108884
Main_GF ssp dp = -0.600922
Main_GF ssp Q = -113.845406
Main_H s h_in = 0.304800
Main_H s h_out = 0.304800
Main_H s d_in = 151.892303
Main_H s d_out = 151.892303
Main_H s l_p = 3.048000
Main_H s a_in = 0.018120
Main_H s a_out = 0.018120
Main_H s m_pipe = 55.230301
Main_H s k_pipe = 0.776874
Main_H s time_flow = 99.261856
Main_H s friction = 0.038714
Main_H s Re = 4663.980957
Main_H s epsilon = 0.001500
Main_H spi0 p_s = -289.193359
Main_H spi0 h = 70.027077
Main_H spi0 v = 0.001000
Main_H spi0 av_visc = 0.001000
Main_H spi0 water = 99.999969
Main_H spo0 h = 70.027077
Main_H spo0 v = 0.001000
Main_H spo0 av_visc = 0.001000
Main_H spo0 water = 99.999969
Main_H sr order = 1
Main_H sr clg_flag = -1
Main_H sr pump_loc = -1
Main_H ss hi_sct = 0.304800
Main_H ss ho_sct = 0.304800
Main_H ss ai_sct = 0.018120
Main_H ss ao_sct = 0.018120
Main_H ss v_sct = 0.001000
Main_H ss ad_max = 1.000000
Main_H ss sum_k = 1.076370
Main_H ss sum_k_a2 = 3278.209473
Main_H ss l_sct = 3.048000
Main_H ss mu = 0.001000
Main_H ssp w = -0.757477
Main_H ssp w_max = 100000.000000
Main_H ssp ad = 10.464168
Main_H ssp cd = 3.620900
Main_H ssp dp = -0.072388
Main_H ssp Q = -45.448616
Main_HG s h_in = 0.304800
Main_HG s h_out = 0.304800
Main_HG s d_in = 151.892303
Main_HG s d_out = 151.892303
Main_HG s l_p = 12.191999
Main_HG s a_in = 0.018120
Main_HG s a_out = 0.018120
Main_HG s m_pipe = 220.921204
Main_HG s k_pipe = 2.742751
Main_HG s time_flow = 261.069000
Main_HG s friction = 0.034170
Main_HG s Re = 7093.226074
Main_HG s epsilon = 0.001500
Main_HG spi0 p_s = -289.602631
Main_HG spi0 h = 70.027077
Main_HG spi0 v = 0.001000
Main_HG spi0 av_visc = 0.001000
Main_HG spi0 water = 99.999969
Main_HG spo0 p_s = -289.193359
Main_HG spo0 h = 70.027077
Main_HG spo0 v = 0.001000
Main_HG spo0 av_visc = 0.001000
Main_HG spo0 water = 99.999977
Main_HG sr order = 1
Main_HG sr clg_flag = -1
Main_HG sr pump_loc = -1
Main_HG ss hi_sct = 0.304800
Main_HG ss ho_sct = 0.304800
Main_HG ss ai_sct = 0.018120
Main_HG ss ao_sct = 0.018120
Main_HG ss v_sct = 0.001000
Main_HG ss ad_max = 1.000000
Main_HG ss sum_k = 3.042247
Main_HG ss sum_k_a2 = 9265.515625
Main_HG ss l_sct = 12.191999
Main_HG ss mu = 0.001000
Main_HG ssp w = -1.136434
Main_HG ssp w_max = 100000.000000
Main_HG ssp ad = 2.776726
Main_HG ssp cd = 2.219539
Main_HG ssp dp = -0.409271
Main_HG ssp Q = -68.186050
Main_IH s h_in = 0.304800
Main_IH s h_out = 0.304800
Main_IH s d_in = 151.892303
Main_IH s d_out = 151.892303
Main_IH s l_p = 13.716000
Main_IH s a_in = 0.018120
Main_IH s a_out = 0.018120
Main_IH s m_pipe = 248.536362
Main_IH s k_pipe = 2.768924
Main_IH s time_flow = 910.841064
Main_IH s friction = 0.030663
Main_IH s Re = 2287.225830
Main_IH s epsilon = 0.001500
Main_IH spi0 p_s = -288.972076
Main_IH spi0 h = 70.027077
Main_IH spi0 v = 0.001000
Main_IH spi0 av_visc = 0.001000
Main_IH spi0 water = 99.999985
Main_IH spo0 p_s = -289.120972
Main_IH spo0 h = 70.027077

Main_IH spo0 v = 0.001000
Main_IH spo0 av_visc = 0.001000
Main_IH spo0 water = 99.999969
Main_IH sr clg_flag = -1
Main_IH sr pump_loc = -1
Main_IH ss hi_sct = 0.304800
Main_IH ss ho_sct = 0.304800
Main_IH ss ai_sct = 0.018120
Main_IH ss ao_sct = 0.018120
Main_IH ss v_sct = 0.001000
Main_IH ss ad_max = 1.000000
Main_IH ss sum_k = 3.068419
Main_IH ss sum_k_a2 = 9345.225586
Main_IH ss l_sct = 13.716000
Main_IH ss mu = 0.001000
Main_IH ssp w = 0.378473
Main_IH ssp w_max = 100000.000000
Main_IH ssp ad = 2.541874
Main_IH ssp cd = 1.197405
Main_IH ssp dp = 0.148895
Main_IH ssp Q = 22.708376
Main_JI r from_out = 1
Main_JI s h_in = 0.304800
Main_JI s h_out = 0.304800
Main_JI s d_in = 151.892303
Main_JI s d_out = 151.892303
Main_JI s l_p = 7.620000
Main_JI s a_in = 0.018120
Main_JI s a_out = 0.018120
Main_JI s m_pipe = 138.075745
Main_JI s k_pipe = 32.106956
Main_JI s friction = 0.640000
Main_JI s Re = 100.000000
Main_JI s epsilon = 0.001500
Main_JI spi0 p_s = 89.524017
Main_JI spi0 h = 70.000000
Main_JI spi0 v = 0.001000
Main_JI spi0 av_visc = 0.001000
Main_JI spi0 water = 100.000000
Main_JI spo0 p_s = -288.972076
Main_JI spo0 h = 70.000000
Main_JI spo0 v = 0.001000
Main_JI spo0 av_visc = 0.001000
Main_JI spo0 water = 100.000000
Main_JI sr empty2 = 1
Main_JI sr order = 1
Main_JI sr clg_flag = 3
Main_JI sr pump_loc = -1
Main_JI ss hi_sct = 0.304800
Main_JI ss ho_sct = 0.304800
Main_JI ss ai_sct = 0.018120
Main_JI ss ao_sct = 0.018120
Main_JI ss v_sct = 0.001000
Main_JI ss ad_max = 1.000000
Main_JI ss sum_k = 999999986991104.000000
Main_JI ss sum_k_a2 =
999999986991104.000000
Main_JI ss l_sct = 10.667999
Main_JI ss mu = 0.001000
Main_JI ssp w_max = 100000.000000
Main_JI ssp dp = 390.297058
Overbd_B-o s p_s = 116.296883
Overbd_B-o s h = 70.013206
Overbd_B-o s v = 0.001000
Overbd_B-o s av_visc = 0.001000
Overbd_B-o s water = 99.999969
Overbd_B-o spi0 p_s = 116.296883
Overbd_B-o spi0 h = 70.013206
Overbd_B-o spi0 v = 0.001000
Overbd_B-o spi0 av_visc = 0.001000
Overbd_B-o spi0 water = 99.999969
Overbd_D-o s p_s = 116.296883
Overbd_D-o s h = 70.012558
Overbd_D-o s v = 0.001000
Overbd_D-o s av_visc = 0.001000
Overbd_D-o s water = 99.999977
Overbd_D-o spi0 p_s = 116.296883
Overbd_D-o spi0 h = 70.012558
Overbd_D-o spi0 v = 0.001000
Overbd_D-o spi0 av_visc = 0.001000
Overbd_D-o spi0 water = 99.999977
Overbd_E-o s p_s = 116.296883
Overbd_E-o s h = 70.048141
Overbd_E-o s v = 0.001000
Overbd_E-o s av_visc = 0.001000
Overbd_E-o s water = 99.999977
Overbd_E-o spi0 p_s = 116.296883
Overbd_E-o spi0 h = 70.048141
Overbd_E-o spi0 v = 0.001000
Overbd_E-o spi0 av_visc = 0.001000
Overbd_E-o spi0 water = 99.999977
Overbd_F-o s p_s = 116.296883
Overbd_F-o s h = 70.000000
Overbd_F-o s v = 0.001000
Overbd_F-o s av_visc = 0.001000
Overbd_F-o s water = 100.000000
Overbd_F-o spi0 p_s = 116.296883
Overbd_F-o spi0 h = 70.000000
Overbd_F-o spi0 v = 0.001000
Overbd_F-o spi0 av_visc = 0.001000
Overbd_F-o spi0 water = 100.000000
Overbd_G-o s p_s = 116.296883
Overbd_G-o s h = 70.000000
Overbd_G-o s v = 0.001000
Overbd_G-o s av_visc = 0.001000
Overbd_G-o s water = 100.000000
Overbd_G-o spi0 p_s = 116.296883
Overbd_G-o spi0 h = 70.000000
Overbd_G-o spi0 v = 0.001000
Overbd_G-o spi0 av_visc = 0.001000
Overbd_G-o spi0 water = 100.000000

Overbd_I-o s p_s = 116.296883
Overbd_I-o s h = 70.000000
Overbd_I-o s v = 0.001000
Overbd_I-o s av_visc = 0.001000
Overbd_I-o s water = 100.000000
Overbd_I-o spi0 p_s = 116.296883
Overbd_I-o spi0 h = 70.000000
Overbd_I-o spi0 v = 0.001000
Overbd_I-o spi0 av_visc = 0.001000
Overbd_I-o spi0 water = 100.000000
Pipe_A1 r num_90 = 1
Pipe_A1 r from_in = 1
Pipe_A1 s h_in = 0.304800
Pipe_A1 s h_out = 0.304800
Pipe_A1 s d_in = 151.892303
Pipe_A1 s d_out = 151.892303
Pipe_A1 s l_p = 3.048000
Pipe_A1 s teta = 45.000000
Pipe_A1 s a_in = 0.018120
Pipe_A1 s a_out = 0.018120
Pipe_A1 s m_pipe = 55.230293
Pipe_A1 s k_f = 19.199999
Pipe_A1 s k_pipe = 12.842783
Pipe_A1 s friction = 0.640000
Pipe_A1 s Re = 100.000000
Pipe_A1 s epsilon = 0.001500
Pipe_A1 spi0 p_s = 101.324997
Pipe_A1 spi0 h = 70.000000
Pipe_A1 spi0 v = 0.001000
Pipe_A1 spi0 av_visc = 0.001000
Pipe_A1 spi0 water = 100.000000
Pipe_A1 spo0 p_s = 101.324997
Pipe_A1 spo0 h = 70.000000
Pipe_A1 spo0 v = 0.001000
Pipe_A1 spo0 av_visc = 0.001000
Pipe_A1 spo0 water = 100.000000
Pipe_B1 r num_90 = 1
Pipe_B1 r from_in = 1
Pipe_B1 s h_in = 0.304800
Pipe_B1 s h_out = 0.304800
Pipe_B1 s d_in = 151.892303
Pipe_B1 s d_out = 151.892303
Pipe_B1 s l_p = 3.048000
Pipe_B1 s a_in = 0.018120
Pipe_B1 s a_out = 0.018120
Pipe_B1 s m_pipe = 55.230282
Pipe_B1 s k_f = 0.496047
Pipe_B1 s k_pipe = 0.331803
Pipe_B1 s friction = 0.016535
Pipe_B1 s Re = 149662.640625
Pipe_B1 s epsilon = 0.001500
Pipe_B1 spi0 p_s = 101.324997
Pipe_B1 spi0 h = 70.468079
Pipe_B1 spi0 v = 0.001000
Pipe_B1 spi0 av_visc = 0.001001
Pipe_B1 spi0 water = 99.999969
Pipe_B1 spo0 p_s = 101.324997
Pipe_B1 spo0 h = 70.477348
Pipe_B1 spo0 v = 0.001000
Pipe_B1 spo0 av_visc = 0.001001
Pipe_B1 spo0 water = 99.999977
Pipe_B2 r from_in = 1
Pipe_B2 s h_in = 1.524000
Pipe_B2 s h_out = 7.620000
Pipe_B2 s d_in = 151.892303
Pipe_B2 s d_out = 151.892303
Pipe_B2 s l_p = 15.240000
Pipe_B2 s a_in = 0.018120
Pipe_B2 s a_out = 0.018120
Pipe_B2 s m_pipe = 276.151520
Pipe_B2 s k_pipe = 2.724983
Pipe_B2 s friction = 0.027159
Pipe_B2 s Re = 16490.109375
Pipe_B2 s epsilon = 0.001500
Pipe_B2 spi0 p_s = 101.300003
Pipe_B2 spi0 h = 70.011238
Pipe_B2 spi0 v = 0.001000
Pipe_B2 spi0 av_visc = 0.001000
Pipe_B2 spi0 water = 99.999977
Pipe_B2 spo0 p_s = 24.583595
Pipe_B2 spo0 h = 70.013206
Pipe_B2 spo0 v = 0.001000
Pipe_B2 spo0 av_visc = 0.001000
Pipe_B2 spo0 water = 99.999969
Pipe_C1 r num_90 = 1
Pipe_C1 r from_out = 1
Pipe_C1 s h_in = 0.304800
Pipe_C1 s h_out = 0.304800
Pipe_C1 s d_in = 151.892303
Pipe_C1 s d_out = 151.892303
Pipe_C1 s l_p = 3.048000
Pipe_C1 s a_in = 0.018120
Pipe_C1 s a_out = 0.018120
Pipe_C1 s m_pipe = 55.230301
Pipe_C1 s k_f = 0.654438
Pipe_C1 s k_pipe = 0.437751
Pipe_C1 s time_flow = 11.375288
Pipe_C1 s friction = 0.021815
Pipe_C1 s Re = 40669.539063
Pipe_C1 s epsilon = 0.001500
Pipe_C1 spi0 p_s = 101.324997
Pipe_C1 spi0 h = 70.009270
Pipe_C1 spi0 v = 0.001000
Pipe_C1 spi0 av_visc = 0.001001
Pipe_C1 spi0 water = 99.999985
Pipe_C1 spo0 p_s = 101.304298
Pipe_C1 spo0 h = 70.009270
Pipe_C1 spo0 v = 0.001000
Pipe_C1 spo0 av_visc = 0.001000
Pipe_C1 spo0 water = 99.999985
Pipe_D1 r num_90 = 1
Pipe_D1 r from_in = 1

Pipe_D1 s h_in = 0.304800
Pipe_D1 s h_out = 0.304800
Pipe_D1 s d_in = 151.892303
Pipe_D1 s d_out = 151.892303
Pipe_D1 s l_p = 3.048000
Pipe_D1 s a_in = 0.018120
Pipe_D1 s a_out = 0.018120
Pipe_D1 s m_pipe = 55.230312
Pipe_D1 s k_f = 0.425089
Pipe_D1 s k_pipe = 0.284340
Pipe_D1 s friction = 0.014170
Pipe_D1 s Re = 340838.625000
Pipe_D1 s epsilon = 0.001500
Pipe_D1 spi0 p_s = 101.324997
Pipe_D1 spi0 h = 70.235962
Pipe_D1 spi0 v = 0.001000
Pipe_D1 spi0 av_visc = 0.001000
Pipe_D1 spi0 water = 99.999992
Pipe_D1 spo0 p_s = 101.324997
Pipe_D1 spo0 h = 70.239746
Pipe_D1 spo0 v = 0.001000
Pipe_D1 spo0 av_visc = 0.001000
Pipe_D1 spo0 water = 99.999992
Pipe_D2 r from_in = 1
Pipe_D2 s h_in = 1.524000
Pipe_D2 s h_out = 7.620000
Pipe_D2 s d_in = 151.892303
Pipe_D2 s d_out = 151.892303
Pipe_D2 s l_p = 15.240000
Pipe_D2 s a_in = 0.018120
Pipe_D2 s a_out = 0.018120
Pipe_D2 s m_pipe = 276.151520
Pipe_D2 s k_pipe = 2.707730
Pipe_D2 s friction = 0.026987
Pipe_D2 s Re = 16903.480469
Pipe_D2 s epsilon = 0.001500
Pipe_D2 spi0 p_s = 101.300003
Pipe_D2 spi0 h = 70.010735
Pipe_D2 spi0 v = 0.001000
Pipe_D2 spi0 av_visc = 0.001000
Pipe_D2 spi0 water = 99.999977
Pipe_D2 spo0 p_s = 24.338196
Pipe_D2 spo0 h = 70.012558
Pipe_D2 spo0 v = 0.001000
Pipe_D2 spo0 av_visc = 0.001000
Pipe_D2 spo0 water = 99.999977
Pipe_E1 r num_90 = 1
Pipe_E1 r from_in = 1
Pipe_E1 s h_in = 0.304800
Pipe_E1 s h_out = 0.304800
Pipe_E1 s d_in = 151.892303
Pipe_E1 s d_out = 151.892303
Pipe_E1 s l_p = 3.048000
Pipe_E1 s a_in = 0.018120
Pipe_E1 s a_out = 0.018120
Pipe_E1 s m_pipe = 55.230293
Pipe_E1 s k_f = 19.199999
Pipe_E1 s k_pipe = 12.842783
Pipe_E1 s friction = 0.640000
Pipe_E1 s Re = 100.000000
Pipe_E1 s epsilon = 0.001500
Pipe_E1 spi0 p_s = 101.324997
Pipe_E1 spi0 h = 70.000000
Pipe_E1 spi0 v = 0.001000
Pipe_E1 spi0 av_visc = 0.001000
Pipe_E1 spi0 water = 100.000000
Pipe_E1 spo0 p_s = 101.324997
Pipe_E1 spo0 h = 70.000000
Pipe_E1 spo0 v = 0.001000
Pipe_E1 spo0 av_visc = 0.001000
Pipe_E1 spo0 water = 100.000000
Pipe_E2 r from_in = 1
Pipe_E2 s h_in = 1.524000
Pipe_E2 s h_out = 7.620000
Pipe_E2 s d_in = 151.892303
Pipe_E2 s d_out = 151.892303
Pipe_E2 s l_p = 15.240000
Pipe_E2 s a_in = 0.018120
Pipe_E2 s a_out = 0.018120
Pipe_E2 s m_pipe = 276.151550
Pipe_E2 s k_pipe = 1.716785
Pipe_E2 s friction = 0.017111
Pipe_E2 s Re = 126003.531250
Pipe_E2 s epsilon = 0.001500
Pipe_E2 spi0 p_s = 101.300003
Pipe_E2 spi0 h = 70.029968
Pipe_E2 spi0 v = 0.001000
Pipe_E2 spi0 av_visc = 0.001000
Pipe_E2 spi0 water = 99.999962
Pipe_E2 spo0 p_s = 22.127150
Pipe_E2 spo0 h = 70.048141
Pipe_E2 spo0 v = 0.001000
Pipe_E2 spo0 av_visc = 0.001000
Pipe_E2 spo0 water = 99.999977
Pipe_F1 r num_90 = 1
Pipe_F1 r from_in = 1
Pipe_F1 s h_in = 0.304800
Pipe_F1 s h_out = 0.304800
Pipe_F1 s d_in = 151.892303
Pipe_F1 s d_out = 151.892303
Pipe_F1 s l_p = 3.048000
Pipe_F1 s a_in = 0.018120
Pipe_F1 s a_out = 0.018120
Pipe_F1 s m_pipe = 55.230293
Pipe_F1 s k_f = 19.199999
Pipe_F1 s k_pipe = 12.842783
Pipe_F1 s friction = 0.640000
Pipe_F1 s Re = 100.000000
Pipe_F1 s epsilon = 0.001500
Pipe_F1 spi0 p_s = 101.324997
Pipe_F1 spi0 h = 70.000000
Pipe_F1 spi0 v = 0.001000

Pipe_F1 spi0 av_visc = 0.001000
Pipe_F1 spi0 water = 100.000000
Pipe_F1 spo0 p_s = 101.324997
Pipe_F1 spo0 h = 70.000000
Pipe_F1 spo0 v = 0.001000
Pipe_F1 spo0 av_visc = 0.001000
Pipe_F1 spo0 water = 100.000000
Pipe_F2 r from_in = 1
Pipe_F2 s h_in = 1.524000
Pipe_F2 s h_out = 7.620000
Pipe_F2 s d_in = 151.892303
Pipe_F2 s d_out = 151.892303
Pipe_F2 s l_p = 15.240000
Pipe_F2 s a_in = 0.018120
Pipe_F2 s a_out = 0.018120
Pipe_F2 s m_pipe = 276.151489
Pipe_F2 s k_pipe = 64.213913
Pipe_F2 s friction = 0.640000
Pipe_F2 s Re = 100.000000
Pipe_F2 s epsilon = 0.001500
Pipe_F2 spi0 p_s = 101.300003
Pipe_F2 spi0 h = 70.000000
Pipe_F2 spi0 v = 0.001000
Pipe_F2 spi0 av_visc = 0.001000
Pipe_F2 spi0 water = 100.000000
Pipe_F2 spo0 p_s = 20.569763
Pipe_F2 spo0 h = 70.000000
Pipe_F2 spo0 v = 0.001000
Pipe_F2 spo0 av_visc = 0.001000
Pipe_F2 spo0 water = 100.000000
Pipe_G1 r num_90 = 1
Pipe_G1 r from_in = 1
Pipe_G1 s h_in = 0.304800
Pipe_G1 s h_out = 0.304800
Pipe_G1 s d_in = 151.892303
Pipe_G1 s d_out = 151.892303
Pipe_G1 s l_p = 3.048000
Pipe_G1 s a_in = 0.018120
Pipe_G1 s a_out = 0.018120
Pipe_G1 s m_pipe = 55.230293
Pipe_G1 s k_f = 19.199999
Pipe_G1 s k_pipe = 12.842783
Pipe_G1 s friction = 0.640000
Pipe_G1 s Re = 100.000000
Pipe_G1 s epsilon = 0.001500
Pipe_G1 spi0 p_s = 101.324997
Pipe_G1 spi0 h = 70.000000
Pipe_G1 spi0 v = 0.001000
Pipe_G1 spi0 av_visc = 0.001000
Pipe_G1 spi0 water = 100.000000
Pipe_G1 spo0 p_s = 101.324997
Pipe_G1 spo0 h = 70.000000
Pipe_G1 spo0 v = 0.001000
Pipe_G1 spo0 av_visc = 0.001000
Pipe_G1 spo0 water = 100.000000
Pipe_G2 r from_in = 1
Pipe_G2 s h_in = 1.524000
Pipe_G2 s h_out = 7.620000
Pipe_G2 s d_in = 151.892303
Pipe_G2 s d_out = 151.892303
Pipe_G2 s l_p = 15.240000
Pipe_G2 s a_in = 0.018120
Pipe_G2 s a_out = 0.018120
Pipe_G2 s m_pipe = 276.151489
Pipe_G2 s k_pipe = 64.213913
Pipe_G2 s friction = 0.640000
Pipe_G2 s Re = 100.000000
Pipe_G2 s epsilon = 0.001500
Pipe_G2 spi0 p_s = 101.300003
Pipe_G2 spi0 h = 70.000000
Pipe_G2 spi0 v = 0.001000
Pipe_G2 spi0 av_visc = 0.001000
Pipe_G2 spi0 water = 100.000000
Pipe_G2 spo0 p_s = 19.205734
Pipe_G2 spo0 h = 70.000000
Pipe_G2 spo0 v = 0.001000
Pipe_G2 spo0 av_visc = 0.001000
Pipe_G2 spo0 water = 100.000000
Pipe_H1 r num_90 = 1
Pipe_H1 r from_in = 1
Pipe_H1 s h_in = 0.304800
Pipe_H1 s h_out = 0.304800
Pipe_H1 s d_in = 151.892303
Pipe_H1 s d_out = 151.892303
Pipe_H1 s l_p = 3.048000
Pipe_H1 s a_in = 0.018120
Pipe_H1 s a_out = 0.018120
Pipe_H1 s m_pipe = 55.230293
Pipe_H1 s k_f = 19.199999
Pipe_H1 s k_pipe = 12.842783
Pipe_H1 s friction = 0.640000
Pipe_H1 s Re = 100.000000
Pipe_H1 s epsilon = 0.001500
Pipe_H1 spi0 p_s = 101.324997
Pipe_H1 spi0 h = 70.000000
Pipe_H1 spi0 v = 0.001000
Pipe_H1 spi0 av_visc = 0.001000
Pipe_H1 spi0 water = 100.000000
Pipe_H1 spo0 p_s = 101.324997
Pipe_H1 spo0 h = 70.000000
Pipe_H1 spo0 v = 0.001000
Pipe_H1 spo0 av_visc = 0.001000
Pipe_H1 spo0 water = 100.000000
Pipe_I1 r num_90 = 1
Pipe_I1 r from_in = 1
Pipe_I1 s h_in = 0.304800
Pipe_I1 s h_out = 0.304800
Pipe_I1 s d_in = 151.892303
Pipe_I1 s d_out = 151.892303
Pipe_I1 s l_p = 3.048000
Pipe_I1 s a_in = 0.018120
Pipe_I1 s a_out = 0.018120

Pipe_I1 s m_pipe = 55.230293
Pipe_I1 s k_f = 19.199999
Pipe_I1 s k_pipe = 12.842783
Pipe_I1 s friction = 0.640000
Pipe_I1 s Re = 100.000000
Pipe_I1 s epsilon = 0.001500
Pipe_I1 spi0 p_s = 101.324997
Pipe_I1 spi0 h = 70.000000
Pipe_I1 spi0 v = 0.001000
Pipe_I1 spi0 av_visc = 0.001000
Pipe_I1 spi0 water = 100.000000
Pipe_I1 spo0 p_s = 101.324997
Pipe_I1 spo0 h = 70.000000
Pipe_I1 spo0 v = 0.001000
Pipe_I1 spo0 av_visc = 0.001000
Pipe_I1 spo0 water = 100.000000
Pipe_I2 r from_in = 1
Pipe_I2 s h_in = 1.524000
Pipe_I2 s h_out = 7.620000
Pipe_I2 s d_in = 151.892303
Pipe_I2 s d_out = 151.892303
Pipe_I2 s l_p = 15.240000
Pipe_I2 s a_in = 0.018120
Pipe_I2 s a_out = 0.018120
Pipe_I2 s m_pipe = 276.151489
Pipe_I2 s k_pipe = 64.213913
Pipe_I2 s friction = 0.640000
Pipe_I2 s Re = 100.000000
Pipe_I2 s epsilon = 0.001500
Pipe_I2 spi0 p_s = 101.300003
Pipe_I2 spi0 h = 70.000000
Pipe_I2 spi0 v = 0.001000
Pipe_I2 spi0 av_visc = 0.001000
Pipe_I2 spi0 water = 100.000000
Pipe_I2 spo0 p_s = 17.983818
Pipe_I2 spo0 h = 70.000000
Pipe_I2 spo0 v = 0.001000
Pipe_I2 spo0 av_visc = 0.001000
Pipe_I2 spo0 water = 100.000000
Pipe_J1 r num_90 = 1
Pipe_J1 r from_in = 1
Pipe_J1 s h_in = 0.304800
Pipe_J1 s h_out = 0.304800
Pipe_J1 s d_in = 151.892303
Pipe_J1 s d_out = 151.892303
Pipe_J1 s l_p = 3.048000
Pipe_J1 s a_in = 0.018120
Pipe_J1 s a_out = 0.018120
Pipe_J1 s m_pipe = 55.230293
Pipe_J1 s k_f = 19.199999
Pipe_J1 s k_pipe = 12.842783
Pipe_J1 s friction = 0.640000
Pipe_J1 s Re = 100.000000
Pipe_J1 s epsilon = 0.001500
Pipe_J1 spi0 p_s = 101.324997
Pipe_J1 spi0 h = 70.000000
Pipe_J1 spi0 v = 0.001000
Pipe_J1 spi0 av_visc = 0.001000
Pipe_J1 spi0 water = 100.000000
Pipe_J1 spo0 p_s = 101.324997
Pipe_J1 spo0 h = 70.000000
Pipe_J1 spo0 v = 0.001000
Pipe_J1 spo0 av_visc = 0.001000
Pipe_J1 spo0 water = 100.000000
Pump_B r man_speed = 95
Pump_B r sw_auto = 1
Pump_B r man_switch = 1
Pump_B s h_in = 0.304800
Pump_B s h_out = 1.524000
Pump_B s d_in = 151.892303
Pump_B s d_out = 151.892303
Pump_B s vol_flow = 0.072264
Pump_B s rate_flow = 0.075710
Pump_B s max_pres = 496.399994
Pump_B s npsh_r = 0.100000
Pump_B s npsh_a = 9.821173
Pump_B s t_ru = 5.000000
Pump_B s t_rd = 5.000000
Pump_B s spd_rated = 2000.000000
Pump_B s spd_p = 2000.000000
Pump_B s spd_rel = 100.000000
Pump_B s power_pump = 5.000000
Pump_B s press_out = 101.300003
Pump_B s press_in = 96.345711
Pump_B s vol_eff = 95.449234
Pump_B s eff_0 = 100.000000
Pump_B s eff_1 = 95.000000
Pump_B s eff_2 = 90.000000
Pump_B s eff_3 = 86.000000
Pump_B s eff_4 0
Pump_B s press_1 = 111.300003
Pump_B s press_2 = 222.899994
Pump_B s press_3 = 385.000000
Pump_B s press_4 = 870.000000
Pump_B s me_eff_0 = 100.000000
Pump_B s me_eff_1 = 95.000000
Pump_B s me_eff_2 = 90.000000
Pump_B s me_eff_3 = 85.000000
Pump_B s me_eff_4 = 80.000000
Pump_B s me_eff = 95.449234
Pump_B s X = 100.000000
Pump_B s power_h = 0.463699
Pump_B sao0 value = 100.000000
Pump_B slo0 value = 1
Pump_B spi0 p_s = 96.345711
Pump_B spi0 h = 70.011238
Pump_B spi0 v = 0.001000
Pump_B spi0 av_visc = 0.001000
Pump_B spi0 water = 99.999977
Pump_B spo0 p_s = 101.300003
Pump_B spo0 h = 70.011238
Pump_B spo0 v = 0.001000

Pump_B spo0 av_visc = 0.001000
Pump_B spo0 water = 99.999977
Pump_D r man_speed = 95
Pump_D r sw_auto = 1
Pump_D r man_switch = 1
Pump_D s h_in = 0.304800
Pump_D s h_out = 1.524000
Pump_D s d_in = 151.892303
Pump_D s d_out = 151.892303
Pump_D s vol_flow = 0.072264
Pump_D s rate_flow = 0.075710
Pump_D s max_pres = 496.399994
Pump_D s npsh_r = 0.100000
Pump_D s npsh_a = 9.796158
Pump_D s t_ru = 5.000000
Pump_D s t_rd = 5.000000
Pump_D s spd_rated = 2000.000000
Pump_D s spd_p = 2000.000000
Pump_D s spd_rel = 100.000000
Pump_D s power_pump = 5.000000
Pump_D s press_out = 101.300003
Pump_D s press_in = 96.100311
Pump_D s vol_eff = 95.449234
Pump_D s eff_0 = 100.000000
Pump_D s eff_1 = 95.000000
Pump_D s eff_2 = 90.000000
Pump_D s eff_3 = 86.000000
Pump_D s press_1 = 111.300003
Pump_D s press_2 = 222.899994
Pump_D s press_3 = 385.000000
Pump_D s press_4 = 870.000000
Pump_D s me_eff_0 = 100.000000
Pump_D s me_eff_1 = 95.000000
Pump_D s me_eff_2 = 90.000000
Pump_D s me_eff_3 = 85.000000
Pump_D s me_eff_4 = 80.000000
Pump_D s me_eff = 95.449234
Pump_D s X = 100.000000
Pump_D s power_h = 0.490207
Pump_D sao0 value = 100.000000
Pump_D sli0 value = 0
Pump_D slo0 value = 1
Pump_D spi0 p_s = 96.100311
Pump_D spi0 h = 70.010735
Pump_D spi0 v = 0.001000
Pump_D spi0 av_visc = 0.001000
Pump_D spi0 water = 99.999977
Pump_D spo0 p_s = 101.300003
Pump_D spo0 h = 70.010735
Pump_D spo0 v = 0.001000
Pump_D spo0 av_visc = 0.001000
Pump_D spo0 water = 99.999977
Pump_E r man_speed = 95
Pump_E r sw_auto = 1
Pump_E s h_in = 0.304800
Pump_E s h_out = 1.524000
Pump_E s d_in = 151.892303
Pump_E s d_out = 151.892303
Pump_E s rate_flow = 0.075710
Pump_E s max_pres = 496.399994
Pump_E s npsh_r = 0.100000
Pump_E s npsh_a = 9.570770
Pump_E s t_ru = 5.000000
Pump_E s t_rd = 5.000000
Pump_E s spd_rated = 2000.000000
Pump_E s power_pump = 5.000000
Pump_E s press_out = 101.300003
Pump_E s press_in = 93.889275
Pump_E s vol_eff = 95.449234
Pump_E s eff_0 = 100.000000
Pump_E s eff_1 = 95.000000
Pump_E s eff_2 = 90.000000
Pump_E s eff_3 = 86.000000
Pump_E s press_1 = 111.300003
Pump_E s press_2 = 222.899994
Pump_E s press_3 = 385.000000
Pump_E s press_4 = 870.000000
Pump_E s me_eff_0 = 100.000000
Pump_E s me_eff_1 = 95.000000
Pump_E s me_eff_2 = 90.000000
Pump_E s me_eff_3 = 85.000000
Pump_E s me_eff_4 = 80.000000
Pump_E s me_eff = 95.449234
Pump_E s X = 100.000000
Pump_E s power_h = 0.132512
Pump_E spi0 p_s = 93.889275
Pump_E spi0 h = 70.029968
Pump_E spi0 v = 0.001000
Pump_E spi0 av_visc = 0.001000
Pump_E spi0 water = 99.999962
Pump_E spo0 p_s = 101.300003
Pump_E spo0 h = 70.029968
Pump_E spo0 v = 0.001000
Pump_E spo0 av_visc = 0.001000
Pump_E spo0 water = 99.999962
Pump_F r man_speed = 95
Pump_F r sw_auto = 1
Pump_F s h_in = 0.304800
Pump_F s h_out = 1.524000
Pump_F s d_in = 151.892303
Pump_F s d_out = 151.892303
Pump_F s rate_flow = 0.075710
Pump_F s max_pres = 496.399994
Pump_F s npsh_r = 0.100000
Pump_F s npsh_a = 9.412016
Pump_F s t_ru = 5.000000
Pump_F s t_rd = 5.000000
Pump_F s spd_rated = 2000.000000
Pump_F s power_pump = 5.000000
Pump_F s press_out = 101.300003
Pump_F s press_in = 92.331871
Pump_F s vol_eff = 95.449234

Pump_F s eff_0 = 100.000000
Pump_F s eff_1 = 95.000000
Pump_F s eff_2 = 90.000000
Pump_F s eff_3 = 86.000000
Pump_F s press_1 = 111.300003
Pump_F s press_2 = 222.899994
Pump_F s press_3 = 385.000000
Pump_F s press_4 = 870.000000
Pump_F s me_eff_0 = 100.000000
Pump_F s me_eff_1 = 95.000000
Pump_F s me_eff_2 = 90.000000
Pump_F s me_eff_3 = 85.000000
Pump_F s me_eff_4 = 80.000000
Pump_F s me_eff = 95.449234
Pump_F s X = 100.000000
Pump_F spi0 p_s = 92.331871
Pump_F spi0 h = 70.000000
Pump_F spi0 v = 0.001000
Pump_F spi0 av_visc = 0.001000
Pump_F spi0 water = 100.000000
Pump_F spo0 p_s = 101.300003
Pump_F spo0 h = 70.000000
Pump_F spo0 v = 0.001000
Pump_F spo0 av_visc = 0.001000
Pump_F spo0 water = 100.000000
Pump_G r man_speed = 95
Pump_G r sw_auto = 1
Pump_G s h_in = 0.304800
Pump_G s h_out = 1.524000
Pump_G s d_in = 151.892303
Pump_G s d_out = 151.892303
Pump_G s rate_flow = 0.075710
Pump_G s max_pres = 496.399994
Pump_G s npsh_r = 0.100000
Pump_G s npsh_a = 9.272971
Pump_G s t_ru = 5.000000
Pump_G s t_rd = 5.000000
Pump_G s spd_rated = 2000.000000
Pump_G s power_pump = 5.000000
Pump_G s press_out = 101.300003
Pump_G s press_in = 90.967842
Pump_G s vol_eff = 95.449234
Pump_G s eff_0 = 100.000000
Pump_G s eff_1 = 95.000000
Pump_G s eff_2 = 90.000000
Pump_G s eff_3 = 86.000000
Pump_G s press_1 = 111.300003
Pump_G s press_2 = 222.899994
Pump_G s press_3 = 385.000000
Pump_G s press_4 = 870.000000
Pump_G s me_eff_0 = 100.000000
Pump_G s me_eff_1 = 95.000000
Pump_G s me_eff_2 = 90.000000
Pump_G s me_eff_3 = 85.000000
Pump_G s me_eff_4 = 80.000000
Pump_G s me_eff = 95.449234
Pump_G s X = 100.000000
Pump_G spi0 p_s = 90.967842
Pump_G spi0 h = 70.000000
Pump_G spi0 v = 0.001000
Pump_G spi0 av_visc = 0.001000
Pump_G spi0 water = 100.000000
Pump_G spo0 p_s = 101.300003
Pump_G spo0 h = 70.000000
Pump_G spo0 v = 0.001000
Pump_G spo0 av_visc = 0.001000
Pump_G spo0 water = 100.000000
Pump_I r man_speed = 95
Pump_I r sw_auto = 1
Pump_I s h_in = 0.304800
Pump_I s h_out = 1.524000
Pump_I s d_in = 151.892303
Pump_I s d_out = 151.892303
Pump_I s rate_flow = 0.075710
Pump_I s max_pres = 496.399994
Pump_I s npsh_r = 0.100000
Pump_I s npsh_a = 9.148413
Pump_I s t_ru = 5.000000
Pump_I s t_rd = 5.000000
Pump_I s spd_rated = 2000.000000
Pump_I s power_pump = 5.000000
Pump_I s press_out = 101.300003
Pump_I s press_in = 89.745926
Pump_I s vol_eff = 95.449234
Pump_I s eff_0 = 100.000000
Pump_I s eff_1 = 95.000000
Pump_I s eff_2 = 90.000000
Pump_I s eff_3 = 86.000000
Pump_I s press_1 = 111.300003
Pump_I s press_2 = 222.899994
Pump_I s press_3 = 385.000000
Pump_I s press_4 = 870.000000
Pump_I s me_eff_0 = 100.000000
Pump_I s me_eff_1 = 95.000000
Pump_I s me_eff_2 = 90.000000
Pump_I s me_eff_3 = 85.000000
Pump_I s me_eff_4 = 80.000000
Pump_I s me_eff = 95.449234
Pump_I s X = 100.000000
Pump_I spi0 p_s = 89.745926
Pump_I spi0 h = 70.000000
Pump_I spi0 v = 0.001000
Pump_I spi0 av_visc = 0.001000
Pump_I spi0 water = 100.000000
Pump_I spo0 p_s = 101.300003
Pump_I spo0 h = 70.000000
Pump_I spo0 v = 0.001000
Pump_I spo0 av_visc = 0.001000
Pump_I spo0 water = 100.000000
Scenario_1 s h_in = 4.978298
Scenario_1 s h_out = 4.978298
Scenario_1 s d_in = 406.400818

Scenario_1 s d_out = 406.400818
Scenario_1 s d_orif = 152.400299
Scenario_1 s beta = 0.375000
Scenario_1 s a_o = 0.018242
Scenario_1 s a_in = 0.129718
Scenario_1 s a_out = 0.129718
Scenario_1 s mean_a_o = 0.129718
Scenario_1 s d_c = 0.608469
Scenario_1 s k_f = 115.055374
Scenario_1 s spd_limit = 50.000000
Scenario_1 spi0 p_s = 101.324997
Scenario_1 spi0 h = 70.027069
Scenario_1 spi0 v = 0.001000
Scenario_1 spi0 av_visc = 0.001000
Scenario_1 spi0 water = 99.999977
Scenario_1 spo0 p_s = 101.324997
Scenario_1 spo0 h = 70.027069
Scenario_1 spo0 v = 0.001000
Scenario_1 spo0 av_visc = 0.001000
Scenario_1 spo0 water = 99.999977
Scenario_2aft r from_out = 1
Scenario_2aft s h_in = 4.978298
Scenario_2aft s h_out = 4.978298
Scenario_2aft s d_in = 406.400818
Scenario_2aft s d_out = 406.400818
Scenario_2aft s d_orif = 152.400299
Scenario_2aft s beta = 0.375000
Scenario_2aft s a_o = 0.018242
Scenario_2aft s a_in = 0.129718
Scenario_2aft s a_out = 0.129718
Scenario_2aft s mean_a_o = 0.129718
Scenario_2aft s d_c = 0.608469
Scenario_2aft s k_f = 115.055374
Scenario_2aft s spd_limit = 50.000000
Scenario_2aft spi0 p_s = 101.324997
Scenario_2aft spi0 h = 70.000000
Scenario_2aft spi0 v = 0.001000
Scenario_2aft spi0 av_visc = 0.001000
Scenario_2aft spi0 water = 100.000000
Scenario_2aft spo0 p_s = 101.324997
Scenario_2aft spo0 h = 70.000000
Scenario_2aft spo0 v = 0.001000
Scenario_2aft spo0 av_visc = 0.001000
Scenario_2aft spo0 water = 100.000000
Scenario_2fwd s h_in = 4.978298
Scenario_2fwd s h_out = 4.978298
Scenario_2fwd s d_in = 406.400818
Scenario_2fwd s d_out = 406.400818
Scenario_2fwd s d_orif = 152.400299
Scenario_2fwd s beta = 0.375000
Scenario_2fwd s a_o = 0.018242
Scenario_2fwd s a_in = 0.129718
Scenario_2fwd s a_out = 0.129718
Scenario_2fwd s mean_a_o = 0.129718
Scenario_2fwd s d_c = 0.608469
Scenario_2fwd s k_f = 115.055374
Scenario_2fwd s spd_limit = 50.000000
Scenario_2fwd spi0 p_s = 101.324997
Scenario_2fwd spi0 h = 70.027069
Scenario_2fwd spi0 v = 0.001000
Scenario_2fwd spi0 av_visc = 0.001000
Scenario_2fwd spi0 water = 99.999977
Scenario_2fwd spo0 p_s = 101.324997
Scenario_2fwd spo0 h = 70.027069
Scenario_2fwd spo0 v = 0.001000
Scenario_2fwd spo0 av_visc = 0.001000
Scenario_2fwd spo0 water = 99.999977
Scenario_3 r from_out = 1
Scenario_3 s h_in = 4.978298
Scenario_3 s h_out = 4.978298
Scenario_3 s d_in = 406.400818
Scenario_3 s d_out = 406.400818
Scenario_3 s d_orif = 152.400299
Scenario_3 s beta = 0.375000
Scenario_3 s a_o = 0.018242
Scenario_3 s a_in = 0.129718
Scenario_3 s a_out = 0.129718
Scenario_3 s mean_a_o = 0.129718
Scenario_3 s d_c = 0.608469
Scenario_3 s k_f = 115.055374
Scenario_3 s spd_limit = 50.000000
Scenario_3 spi0 p_s = 101.324997
Scenario_3 spi0 h = 70.000000
Scenario_3 spi0 v = 0.001000
Scenario_3 spi0 av_visc = 0.001000
Scenario_3 spi0 water = 100.000000
Scenario_3 spo0 p_s = 101.324997
Scenario_3 spo0 h = 70.000000
Scenario_3 spo0 v = 0.001000
Scenario_3 spo0 av_visc = 0.001000
Scenario_3 spo0 water = 100.000000
Suction_B r num_90 = 1
Suction_B r from_in = 1
Suction_B s h_in = 0.304800
Suction_B s h_out = 0.304800
Suction_B s d_in = 151.892303
Suction_B s d_out = 151.892303
Suction_B s l_p = 3.048000
Suction_B s a_in = 0.018120
Suction_B s a_out = 0.018120
Suction_B s m_pipe = 55.230301
Suction_B s k_f = 0.814771
Suction_B s k_pipe = 0.544996
Suction_B s friction = 0.027159
Suction_B s Re = 16490.125000
Suction_B s epsilon = 0.001500
Suction_B spi0 p_s = -293.663116
Suction_B spi0 h = 70.010735
Suction_B spi0 v = 0.001000
Suction_B spi0 av_visc = 0.001000
Suction_B spi0 water = 99.999977
Suction_B spo0 p_s = 96.345711

Suction_B spo0 h = 70.011238
Suction_B spo0 v = 0.001000
Suction_B spo0 av_visc = 0.001000
Suction_B spo0 water = 99.999977
Suction_D r num_90 = 1
Suction_D r from_in = 1
Suction_D s h_in = 0.304800
Suction_D s h_out = 0.304800
Suction_D s d_in = 151.892303
Suction_D s d_out = 151.892303
Suction_D s l_p = 3.048000
Suction_D s a_in = 0.018120
Suction_D s a_out = 0.018120
Suction_D s m_pipe = 55.230301
Suction_D s k_f = 0.809613
Suction_D s k_pipe = 0.541546
Suction_D s friction = 0.026987
Suction_D s Re = 16903.494141
Suction_D s epsilon = 0.001500
Suction_D spi0 p_s = -292.905060
Suction_D spi0 h = 70.010300
Suction_D spi0 v = 0.001000
Suction_D spi0 av_visc = 0.001000
Suction_D spi0 water = 99.999985
Suction_D spo0 p_s = 96.100311
Suction_D spo0 h = 70.010735
Suction_D spo0 v = 0.001000
Suction_D spo0 av_visc = 0.001000
Suction_D spo0 water = 99.999977
Suction_E r num_90 = 1
Suction_E r from_in = 1
Suction_E s h_in = 0.304800
Suction_E s h_out = 0.304800
Suction_E s d_in = 151.892303
Suction_E s d_out = 151.892303
Suction_E s l_p = 3.048000
Suction_E s a_in = 0.018120
Suction_E s a_out = 0.018120
Suction_E s m_pipe = 55.230309
Suction_E s k_f = 0.513320
Suction_E s k_pipe = 0.343357
Suction_E s friction = 0.017111
Suction_E s Re = 126003.679688
Suction_E s epsilon = 0.001500
Suction_E spi0 p_s = -291.616547
Suction_E spi0 h = 70.029167
Suction_E spi0 v = 0.001000
Suction_E spi0 av_visc = 0.001000
Suction_E spi0 water = 99.999969
Suction_E spo0 p_s = 93.889275
Suction_E spo0 h = 70.029968
Suction_E spo0 v = 0.001000
Suction_E spo0 av_visc = 0.001000
Suction_E spo0 water = 99.999962
Suction_F r num_90 = 1
Suction_F r from_in = 1
Suction_F s h_in = 0.304800
Suction_F s h_out = 0.304800
Suction_F s d_in = 151.892303
Suction_F s d_out = 151.892303
Suction_F s l_p = 3.048000
Suction_F s a_in = 0.018120
Suction_F s a_out = 0.018120
Suction_F s m_pipe = 55.230293
Suction_F s k_f = 19.199999
Suction_F s k_pipe = 12.842783
Suction_F s friction = 0.640000
Suction_F s Re = 100.000000
Suction_F s epsilon = 0.001500
Suction_F spi0 p_s = -290.709442
Suction_F spi0 h = 70.000000
Suction_F spi0 v = 0.001000
Suction_F spi0 av_visc = 0.001000
Suction_F spi0 water = 100.000000
Suction_F spo0 p_s = 92.331871
Suction_F spo0 h = 70.000000
Suction_F spo0 v = 0.001000
Suction_F spo0 av_visc = 0.001000
Suction_F spo0 water = 100.000000
Suction_G r num_90 = 1
Suction_G r from_in = 1
Suction_G s h_in = 0.304800
Suction_G s h_out = 0.304800
Suction_G s d_in = 151.892303
Suction_G s d_out = 151.892303
Suction_G s l_p = 3.048000
Suction_G s a_in = 0.018120
Suction_G s a_out = 0.018120
Suction_G s m_pipe = 55.230293
Suction_G s k_f = 19.199999
Suction_G s k_pipe = 12.842783
Suction_G s friction = 0.640000
Suction_G s Re = 100.000000
Suction_G s epsilon = 0.001500
Suction_G spi0 p_s = -289.885223
Suction_G spi0 h = 70.000000
Suction_G spi0 v = 0.001000
Suction_G spi0 av_visc = 0.001000
Suction_G spi0 water = 100.000000
Suction_G spo0 p_s = 90.967842
Suction_G spo0 h = 70.000000
Suction_G spo0 v = 0.001000
Suction_G spo0 av_visc = 0.001000
Suction_G spo0 water = 100.000000
Suction_I r num_90 = 1
Suction_I r from_in = 1
Suction_I s h_in = 0.304800
Suction_I s h_out = 0.304800
Suction_I s d_in = 151.892303
Suction_I s d_out = 151.892303
Suction_I s l_p = 3.048000
Suction_I s a_in = 0.018120

Suction_I s a_out = 0.018120
Suction_I s m_pipe = 55.230293
Suction_I s k_f = 19.199999
Suction_I s k_pipe = 12.842783
Suction_I s friction = 0.640000
Suction_I s Re = 100.000000
Suction_I s epsilon = 0.001500
Suction_I spi0 p_s = -289.120972
Suction_I spi0 h = 70.000000
Suction_I spi0 v = 0.001000
Suction_I spi0 av_visc = 0.001000
Suction_I spi0 water = 100.000000
Suction_I spo0 p_s = 89.745926
Suction_I spo0 h = 70.000000
Suction_I spo0 v = 0.001000
Suction_I spo0 av_visc = 0.001000
Suction_I spo0 water = 100.000000
Tee_G r pnode_id = 3
Tee_G r JctType = 1
Tee_G r KValType = 1
Tee_G s p_s_j = -289.602631
Tee_G s h_j = 70.027077
Tee_G s v_j = 0.001000
Tee_G s cap_j = 0.001000
Tee_G s sum_w_net = 0.306335
Tee_G s vol_j = 0.001000
Tee_G s m_j = 1.000000
Tee_G s cd_lk = 100.000000
Tee_G s k_f_tr = 0.299496
Tee_G s k_f_tb = 0.898487
Tee_G s epsilon = 0.046000
Tee_G s av_visc_j = 0.001000
Tee_G s water_j = 99.999969
Tee_G s angle = 90.000000
Tee_G s KBrnIn = 50.000000
Tee_G s KRunIn = 10.000000
Tee_G s KRunOut = 10.000000
Tee_G spi0 p_s = -289.602631
Tee_G spi0 h = 70.027077
Tee_G spi0 v = 0.001000
Tee_G spi0 av_visc = 0.001000
Tee_G spi0 water = 99.999969
Tee_G spi1 p_s = -289.602631
Tee_G spi1 h = 70.000000
Tee_G spi1 v = 0.001000
Tee_G spi1 av_visc = 0.001000
Tee_G spi1 water = 100.000000
Tee_G spo0 p_s = -289.602631
Tee_G spo0 h = 70.027077
Tee_G spo0 v = 0.001000
Tee_G spo0 av_visc = 0.001000
Tee_G spo0 water = 99.999969

APPENDIX C. COMPARTMENT VOLUME PROGRAM

```
% This program computes 10 values of height vs. volume for each
% compartment of the Wigley Hull

format long
j=1;
x=[200,150,120,80,50,0,-25,-90,-130,-160,-200]; % bulkheads
tvol=zeros(10,11);        % 10 heights with first being zero
while j<11
   i=1;
   zdelta=40/9;
      for z=0:zdelta:40
         xl=x(j+1);       % compartment's aft bulkhead
         xh=x(j);         % compartment's fwd bulkhead
         tvol(i,1)=z;     % height
         tvol(i,j+1)=2*((z^2)/2-(z^3)/240)*((xh-xl)-
(4/(3*400^2))*(xh^3-xl^3));
         i=i+1;
      end
   tvol
   j=j+1;
 end
end

%results
%tvol =
%  1.0e+004 *         Volume              Volume              Volume
%        height       Compartment A       Compartment B       Compartment C
%                  0                   0                   0                   0
%  0.00044444444444   0.02179545800945   0.03095747599451   0.05681085200427
%  0.00088888888889   0.08382868465173   0.11906721536351   0.21850327693949
%  0.00133333333333   0.18106995884774   0.25718518518519   0.47196707818930
%  0.00177777777778   0.30848955951837   0.43816735253772   0.80409205913733
%  0.00222222222222   0.46105776558451   0.65486968449931   1.20176802316720
%  0.00266666666667   0.63374485596708   0.90014814814815   1.65188477366255
%  0.00311111111111   0.82152110958695   1.16685871056241   2.14133211400701
%  0.00355555555556   1.01935680536504   1.44785733882030   2.65699984758421
%  0.00400000000000   1.22222222222222   1.73600000000000   3.18577777777778

%  Volume             Volume              Volume              Volume
%  Compartment D      Compartment E       Comaprtment F       Compartment G
%                  0                   0                   0                   0
%  0.05093004115226   0.09312604785856   0.04730605090687   0.11233180917543
%  0.19588477366255   0.35817710714830   0.18194634964182   0.43204541990550
%  0.42311111111111   0.77366255144033   0.39300411522634   0.93321810699588
%  0.72085596707819   1.31809175430575   0.66956256668191   1.58992714525225
%  1.07736625514403   1.96997408931565   1.00070492303003   2.37624980948026
%  1.48088888888889   2.70781893004115   1.37551440329218   3.26626337448560
%  1.91967078189300   3.51013565005335   1.78307422648986   4.23404511507392
%  2.38195884773663   4.35543362292334   2.21246761164457   5.25367230605091
%  2.85600000000000   5.22222222222222   2.65277777777778   6.29922222222222
```

%	Volume Compartment H	Volume Compartment I	Volume Compartment J
%	0	0	0
%	0.05281633897272	0.02696296296296	0.01420271300107
%	0.20313976527968	0.10370370370370	0.05462581923487
%	0.43878189300412	0.22400000000000	0.11799176954733
%	0.74755433622923	0.38162962962963	0.20102301478433
%	1.11726870903826	0.57037037037037	0.30044200579180
%	1.53573662551440	0.78400000000000	0.41297119341564
%	1.99076969974089	1.01629629629630	0.53533302850175
%	2.47017954580095	1.26103703703704	0.66424996189605
%	2.96177777777778	1.51200000000000	0.79644444444444

APPENDIX D. NAVAL ARCHITECTURE SPREADSHEET

Scenario 1

Compartment A (x coords: 200 to 150)		**Compartment F (x coords: 0 to -25)**	
[redacted]	Tank level	[redacted]	tank level
[redacted]	Tank volume	[redacted]	tank volume
167.04545	x coord centroid	-12.46728	x coord centroid
0.0002491	z coord centroid	0.0002491	z coord centroid
Compartment B (x coords: 150 to 120)		**Compartment G (x coords: -25 to -90)**	
[redacted]	Tank level	[redacted]	tank level
[redacted]	Tank volume	[redacted]	tank volume
134.06682	x coord centroid	-56.38586	x coord centroid
12.543783	z coord centroid	0.0002491	z coord centroid
Compartment C (x coords: 120 to 80)		**Compartment H (x coords: -90 to -130)**	
[redacted]	Tank level	[redacted]	tank level
[redacted]	Tank volume	[redacted]	tank volume
99.107143	x coord centroid	-108.9436	x coord centroid
20.147253	z coord centroid	0.0002491	z coord centroid
Compartment D (x coords: 80 to 50)		**Compartment I (x coords: -130 to -160)**	
[redacted]	Tank level	[redacted]	tank level
[redacted]	Tank volume	[redacted]	tank volume
64.726891	x coord centroid	-143.8492	x coord centroid
0.0002491	z coord centroid	0.0002491	z coord centroid
Compartment E (x coords: 50 to 0)		**Compartment J (x coords: -200 to -160)**	
[redacted]	Tank level	[redacted]	tank level
[redacted]	Tank volume	[redacted]	tank volume
24.734043	x coord centroid	-173.5714	x coord centroid
0.0002491	z coord centroid	0.0002491	z coord centroid

5142.857	Initial displacement
25	Initial KG
5921.859	Revised displacement
32.37524	Revised draft
20.27218	KB
396.7514	BM (L)
417.0235	KM (L)
24.1678	KG
392.8557	GM (L)
484.6742	Moment to trim 1 in
169.7025	Trim (in)
13.88929	LCG
39.93723	Draft fwd
24.81326	Draft aft
48.36139	BM(T)
68.63357	KM(T)
44.46577	GM(T)

	Hull hole scenario 3		**overboard B**		**overboard F**
-15	Initial x coord	135	Initial x coord	-12.5	Initial x coord
20	Initial z coord	25	Initial z coord	25	Initial z coord
11.35387	Revised depth	12.29617	Revised depth	6.44226	Revised depth
19.62001	Revised pressure	20.02834	Revised pressure	17.49165	Revised pressure
[redacted]	Simsmart pressure		**overboard D**		**overboard G**
	Hull hole scenario 2	65	Initial x coord	-55	Initial x coord
65	Initial x coord	25	Initial z coord	25	Initial z coord
20	Initial z coord	9.451958	Revised depth	4.939686	Revised depth
14.45196	Revised depth	18.79585	Revised pressure	16.84053	Revised pressure
20.96251	Revised pressure		**overboard E**		**overboard I**
[redacted]	Simsmart pressure	25	Initial x coord	-145	Initial x coord
	Hull hole scenario 1	25	Initial z coord	25	Initial z coord
100	Initial x coord	7.826691	Revised depth	1.757764	Revised depth
20	Initial z coord	18.09157	Revised pressure	15.4617	Revised pressure
15.87407	Revised depth				
21.57876	Revised pressure				
[redacted]	Simsmart pressure				

Excel cell formulas

	A	B
1	**Compartment A (x coords: 200 to 150)**	
2	(Simlinkser|PFhullfull!'Compartment_A@l_tk@s')	tank level
3	(Simlinkser|PFhullfull!'Compartment_A@v_tk@s')	tank volume
4	(((A32^2-A33^2)/2)-(A32^4-A33^4)/(400^2))/((A32-A33)-4*(A32^3-A33^3)/(3*(400^2)))	x coord centroid
5	(((A2^3)/3)-((A2^4)/320))*((A32-A33-(A32^3-A33^3)/120000)/(A3/2))	z coord centroid
6		
7	**Compartment B (x coords: 150 to 120)**	
8	(Simlinkser|PFhullfull!'Compartment_B@l_tk@s')	tank level
9	(Simlinkser|PFhullfull!'Compartment_B@v_tk@s')	tank volume
10	(((A33^2-A34^2)/2)-(A33^4-A34^4)/(400^2))/((A33-A34)-4*(A33^3-A34^3)/(3*(400^2)))	x coord centroid
11	(((A8^3)/3)-((A8^4)/320))*((A33-A34-(A33^3-A34^3)/120000)/(A9/2))	z coord centroid
12		
13	**Compartment C (x coords: 120 to 80)**	
14	(Simlinkser|PFhullfull!'Compartment_C@l_tk@s')	tank level
15	(Simlinkser|PFhullfull!'Compartment_C@v_tk@s')	tank volume
16	(((A34^2-A35^2)/2)-(A34^4-A35^4)/(400^2))/((A34-A35)-4*(A34^3-A35^3)/(3*(400^2)))	x coord centroid
17	(((A14^3)/3)-((A14^4)/320))*((A34-A35-(A34^3-A35^3)/120000)/(A15/2))	z coord centroid
18		
19	**Compartment D (x coords: 80 to 50)**	
20	(Simlinkser|PFhullfull!'Compartment_D@l_tk@s')	tank level
21	(Simlinkser|PFhullfull!'Compartment_D@v_tk@s')	tank volume
22	(((A35^2-A36^2)/2)-(A35^4-A36^4)/(400^2))/((A35-A36)-4*(A35^3-A36^3)/(3*(400^2)))	x coord centroid
23	(((A20^3)/3)-((A20^4)/320))*((A35-A36-(A35^3-A36^3)/120000)/(A21/2))	z coord centroid
24		
25	**Compartment E (x coords: 50 to 0)**	
26	(Simlinkser|PFhullfull!'Compartment_E@l_tk@s')	tank level
27	(Simlinkser|PFhullfull!'Compartment_E@v_tk@s')	tank volume
28	(((A36^2-A37^2)/2)-(A36^4-A37^4)/(400^2))/((A36-A37)-4*(A36^3-A37^3)/(3*(400^2)))	x coord centroid
29	(((A26^3)/3)-((A26^4)/320))*((A36-A37-(A36^3-A37^3)/120000)/(A27/2))	z coord centroid
30		
31	**Bulkheads**	
32	200	
33	150	
34	120	
35	80	
36	50	
37	0	
38	-25	
39	-90	
40	-130	
41	-160	
42	-200	

	D	E
1	**Compartment F (x coords: 0 to -25)**	
2	(Simlinkser|PFhullfull!'Compartment_F@l_tk@s')	tank level
3	(Simlinkser|PFhullfull!'Compartment_F@v_tk@s')	tank volume
4	(((A37^2-A38^2)/2)-(A37^4-A38^4)/(400^2))/((A37-A38)-4*(A37^3-A38^3)/(3*(400^2)))	x coord centroid
5	(((D2^3)/3)-((D2^4)/320))*((A37-A38-(A37^3-A38^3)/120000)/(D3/2))	z coord centroid
6		
7	**Compartment G (x coords: -25 to -90)**	
8	(Simlinkser|PFhullfull!'Compartment_G@l_tk@s')	tank level
9	(Simlinkser|PFhullfull!'Compartment_G@v_tk@s')	tank volume
10	(((A38^2-A39^2)/2)-(A38^4-A39^4)/(400^2))/((A38-A39)-4*(A38^3-A39^3)/(3*(400^2)))	x coord centroid
11	(((D8^3)/3)-((D8^4)/320))*((A38-A39-(A38^3-A39^3)/120000)/(D9/2))	z coord centroid
12		
13	**Compartment H (x coords: -90 to -130)**	
14	(Simlinkser|PFhullfull!'Compartment_H@l_tk@s')	tank level
15	(Simlinkser|PFhullfull!'Compartment_H@v_tk@s')	tank volume
16	(((A39^2-A40^2)/2)-(A39^4-A40^4)/(400^2))/((A39-A40)-4*(A39^3-A40^3)/(3*(400^2)))	x coord centroid
17	(((D14^3)/3)-((D14^4)/320))*((A39-A40-(A39^3-A40^3)/120000)/(D15/2))	z coord centroid
18		
19	**Compartment I (x coords: -130 to -160)**	
20	(Simlinkser|PFhullfull!'Compartment_I@l_tk@s')	tank level
21	(Simlinkser|PFhullfull!'Compartment_I@v_tk@s')	tank volume
22	(((A40^2-A41^2)/2)-(A40^4-A41^4)/(400^2))/((A40-A41)-4*(A40^3-A41^3)/(3*(400^2)))	x coord centroid
23	(((D20^3)/3)-((D20^4)/320))*((A40-A41-(A40^3-A41^3)/120000)/(D21/2))	z coord centroid
24		
25	**Compartment J (x coords: -200 to -160)**	
26	(Simlinkser|PFhullfull!'Compartment_J@l_tk@s')	tank level
27	(Simlinkser|PFhullfull!'Compartment_J@v_tk@s')	tank volume
28	(((A41^2-A42^2)/2)-(A41^4-A42^4)/(400^2))/((A41-A42)-4*(A41^3-A42^3)/(3*(400^2)))	x coord centroid
29	(((D26^3)/3)-((D26^4)/320))*((A41-A42-(A41^3-A42^3)/120000)/(D27/2))	z coord centroid

	G	H
1	180000/35	initial displacement
2	25	initial KG
3	G1+(A3+A9+A15+A21+A27+D3+D9+D15+D21+D27)/35	revised displacement
4	G3^3*(10^-11)*(8.404)-G3^2*(10^-6)*(1.30242217)+G3*0.00973063695146+2.973060313161	revised draft
5	(((G4^3)/3)-((G4^4)/320))*(266.66666/((35*G3)/2))	KB
6	85333333.33*(1-((40-G4)/40)^2)/(G3*35)	BM (L)
7	G5+G6	KM (L)
8	(G2*G1+(A3*A5+A9*A11+A15*A17+A21*A23+A27*A29+D3*D5+D9*D11+D15*D17+D21*D23+D27*D29)/35)/G3	KG
9	G7-G8	GM (L)
10	G3*G9/(12*400)	moment to trim 1 in
11	(A3*A4+A9*A10+A15*A16+A21*A22+A27*A28+D3*D4+D9*D10+D15*D16+D21*D22+D27*D28)/(35*G10)	trim (in)
12	(A3*A4+A9*A10+A15*A16+A21*A22+A27*A28+D3*D4+D9*D10+D15*D16+D21*D22+D27*D28)/(35*G3)	LCG
13	G4+(200+ABS(G12))*(G11)/(400*12)	draft fwd
14	2*G4-G13	draft aft
15	(2/3)*(20^3)*((1-((40-G4)^2)/40^2)^3)*(2)*1050.071/(G3*35)	BM(T)
16	G5+G15	KM(T)
17	G16-G8	GM(T)

	J	K
1		**hull hole scenario 3**
2	-15	Initial x coord
3	20	Initial z coord
4	G4-J3+(G12-J2)*(-1)*(G4-G14)/(200+G12)	Revised depth
5	14.7+62.4*J4/144	Revised pressure
6	(Simlinkser|PFhullfull!'Hole_Depth_F-i@p_s@s')	Simsmart pressure
7		**hull hole scenario 2**
8	65	Initial x coord
9	20	Initial z coord
10	G4-J9-(J8-G12)*(G4-G13)/(200-G12)	Revised depth
11	14.7+62.4*J10/144	Revised pressure
12	(Simlinkser|PFhullfull!'Hole_Depth_D-i@p_s@s')	Simsmart pressure
13		**hull hole scenario 1**
14	100	Initial x coord
15	20	Initial z coord
16	G4-J15-(J14-G12)*(G4-G13)/(200-G12)	Revised depth
17	14.7+62.4*J16/144	Revised pressure
18	(Simlinkser|PFhullfull!'Hole_Depth_C-i@p_s@s')	Simsmart pressure

	M	N
1		**Overboard B**
2	135	Initial x coord
3	25	Initial z coord
4	G4-M3-(M2-G12)*(G4-G13)/(200-G12)	Revised depth
5	14.7+62.4*M4/144	Revised pressure
6		**Overboard D**
7	65	Initial x coord
8	25	Initial z coord
9	G4-M8-(M7-G12)*(G4-G13)/(200-G12)	Revised depth
10	14.7+62.4*M9/144	Revised pressure
11		**Overboard E**
12	25	Initial x coord
13	25	Initial z coord
14	G4-M13-(M12-G12)*(G4-G13)/(200-G12)	Revised depth
15	14.7+62.4*M14/144	Revised pressure

	P	Q
1		**overboard F**
2	-12.5	Initial x coord
3	25	Initial z coord
4	G4-P3+(G12-P2)*(-1)*(G4-G14)/(200+G12)	Revised depth
5	14.7+62.4*P4/144	Revised pressure
6		**overboard G**
7	-55	Initial x coord
8	25	Initial z coord
9	G4-P8+(G12-P7)*(-1)*(G4-G14)/(200+G12)	Revised depth
10	14.7+62.4*P9/144	Revised pressure
11		**overboard I**
12	-145	Initial x coord
13	25	Initial z coord
14	G4-P13+(G12-P12)*(-1)*(G4-G14)/(200+G12)	Revised depth
15	14.7+62.4*P14/144	Revised pressure

APPENDIX E. DRAFT POLYNOMIAL PROGRAM

```
% This program computes a third order polynomial of draft as a function
% of displaced volume. It is accomplished by first creating a curve of
% draft vs. displaced volume and then applying a curve fitting routine,
% such as polyfit, to it.

format long
tvol=zeros(101,2);
i=1;
zdelta=40/100;
for z=0:zdelta:40
   xl=-200;
   xh=200;
   tdisp(i,1)=z;
   tdisp(i,2)=2*((z^2)/2-(z^3)/240)*((xh-xl)-(4/(3*400^2))*(xh^3-
xl^3))/35;
   i=i+1;
end
plot(tdisp(:,2),tdisp(:,1));
y=tdisp(:,1);
x=tdisp(:,2);
p=polyfit(x,y,3);


% polynomial approximation
% z=(vol^3)*0.00000000008404 - (vol^2)*0.00000130242217 +
     vol*0.00973063695146 + 2.80840409822672

%p(1)    8.403941735996557e-011
%p(2)   -1.302422165138507e-006
%p(3)    0.00973063695146
%p(4)    2.80840409822672
```

APPENDIX F. EXCEL TRANSFER MACRO

```
Sub transfer()
    '
    ' transfer Macro
    ' Macro recorded 10/30/98 by Preferred Customer
    '
    'establishes a conversation with a server application
    'that supports the specified service name and topic
    'name pair
    SIMSMARTchan = Application.DDEInitiate("simlinkser", "PFhullfull")

    'WriteValues
    Set J5 = Worksheets("Sheet1").Range("J5")
    Set J11 = Worksheets("Sheet1").Range("J11")
    Set J17 = Worksheets("Sheet1").Range("J17")
    Set M5 = Worksheets("Sheet1").Range("M5")
    Set M10 = Worksheets("Sheet1").Range("M10")
    Set M15 = Worksheets("Sheet1").Range("M15")
    Set p5 = Worksheets("Sheet1").Range("p5")
    Set p10 = Worksheets("Sheet1").Range("p10")
    Set p15 = Worksheets("Sheet1").Range("p15")

    'write data through chanel
    If 2 >= 1 Then
    Application.DDEPoke SIMSMARTchan, "Hole_Depth_F-i@p_s@s", J5
    Application.DDEPoke SIMSMARTchan, "Hole_Depth_D-i@p_s@s", J11
    Application.DDEPoke SIMSMARTchan, "Hole_Depth_C-i@p_s@s", J17
    Application.DDEPoke SIMSMARTchan, "Overbd_B-o@p_s@s", M5
    Application.DDEPoke SIMSMARTchan, "Overbd_D-o@p_s@s", M10
    Application.DDEPoke SIMSMARTchan, "Overbd_E-o@p_s@s", M15
    Application.DDEPoke SIMSMARTchan, "Overbd_F-o@p_s@s", p5
    Application.DDEPoke SIMSMARTchan, "Overbd_G-o@p_s@s", p10
    Application.DDEPoke SIMSMARTchan, "Overbd_I-o@p_s@s", p15
    End If

    'close the conversation
    Application.DDETerminate SIMSMARTchan

End Sub
```

APPENDIX G. SCENARIO 1 RESULTS

Entire scenario run at speed ratio of 6.

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Time (min)
30.00392	30.00392	30.00392	45.44269	5144.16146	-7E-08	0
30.07891	30.29863	29.85919	45.4847	5169.13938	0.478898	1.12
30.15465	30.59678	29.71253	45.51058	5194.36422	0.957856	2.22
30.21598	30.83856	29.5934	45.52039	5214.78786	1.342256	3.1
30.2918	31.13789	29.44571	45.53066	5240.03224	1.813248	4.18
30.36713	31.43573	29.29852	45.52702	5265.10460	2.27656	5.25
30.44072	31.72713	29.15432	45.51716	5289.59063	2.724799	6.28
30.49095	31.9262	29.0557	45.51123	5306.2943	3.0282	7
30.57532	32.26096	28.88968	45.49167	5334.33747	3.533297	8.15
30.65442	32.57545	28.7334	45.46233	5360.61137	4.002143	9.23
30.72065	32.84286	28.59844	45.43851	5382.59132	4.398718	10.13
30.79738	33.15553	28.43922	45.41591	5408.03241	4.859011	11.17
30.861	33.41647	28.30554	45.3931	5429.11074	5.239939	12
30.94943	33.78124	28.11762	45.35458	5458.37161	5.767459	13.2
31.01976	34.07317	27.96634	45.32118	5481.61477	6.185585	14.17
31.08483	34.34464	27.82501	45.28696	5503.09394	6.571191	15.08
31.15648	34.64491	27.66804	45.255	5526.71605	6.994203	16.12
31.21647	34.89735	27.53559	45.22602	5546.46962	7.346936	17
31.29178	35.21555	27.36801	45.18597	5571.22974	7.787796	18.13
31.35886	35.50023	27.2175	45.14774	5593.2535	8.17876	19.17
31.41818	35.75286	27.0835	45.11413	5612.69725	8.523043	20.1
31.48148	36.02341	26.93955	45.07629	5633.41485	8.888989	21.12
31.53337	36.24595	26.82078	45.04373	5650.37459	9.1879	22
31.59915	36.52907	26.66924	45.00044	5671.84324	9.565472	23.07
31.66354	36.80709	26.51999	44.96173	5692.81737	9.933426	24.17
31.71906	37.04761	26.39052	44.92659	5710.87497	10.24945	25.13
31.77272	37.28068	26.26475	44.89098	5728.29529	10.55366	26.08
31.82088	37.49043	26.15133	44.86103	5743.91046	10.82583	26.95
31.88098	37.75291	26.00906	44.82252	5763.3645	11.16423	28.05
31.93553	37.9918	25.87925	44.78639	5780.98645	11.47016	29.07
31.99088	38.23495	25.74682	44.74854	5798.83931	11.77953	30.12
32.04783	38.48581	25.60985	44.70831	5817.17114	12.09665	31.22
32.09281	38.68451	25.50112	44.67557	5831.62688	12.34634	32.1
32.14546	38.91764	25.37328	44.63612	5848.5175	12.63766	33.15
32.18988	39.11456	25.2652	44.6017	5862.74305	12.88224	34.05
32.23848	39.3301	25.14686	44.56535	5878.28176	13.14835	35.05
32.28077	39.51775	25.04379	44.53401	5891.77942	13.37871	35.53
32.33499	39.75844	24.91154	44.49529	5909.05513	13.67243	37.08
32.37524	39.93723	24.81326	44.46577	5921.85905	13.88929	37.52

Hull hole (gpm)	Bulkhd (gpm)	Comp_B Level	Comp_B vol	Comp_C level	Comp_C vol	Time (min)
0	0	0.04	2.78613	0.04	5.1129	0
5972.82	0	0.04	2.78613	5.299947	879.3398	1.12
6028.86	0	0.04	2.78613	7.726685	1762.209	2.22
6075.77	0	0.04	2.78613	9.400917	2477.037	3.1
6130.01	0	0.04	2.78613	10.950212	3360.59	4.18
6177.61	0	0.04	2.78613	12.488948	4238.123	5.25
6228.43	0	0.04	2.78613	13.835773	5095.134	6.28
6262	0	0.04	2.78613	14.618114	5679.762	7
6320.89	0	0.04	2.78613	15.931557	6661.273	8.15
6373.19	188.887	0.071662	4.991493	17.159182	7578.654	9.23
6402.18	485.334	0.706899	49.23783	18.07147	8303.706	10.13
6469.03	659.216	1.853814	129.1242	18.977345	9114.258	11.17
6511.47	771.805	3.025334	210.7244	19.710651	9770.399	12
6378.56	902.512	4.616314	343.6428	20.706675	10661.61	13.2
6212.78	992.057	5.234919	466.2795	21.478798	11352.49	14.17
6060.76	1066.66	5.871991	592.5775	22.177828	11977.96	15.08
5913.63	1133.69	6.639455	744.7254	22.849125	12652.58	16.12
5795.14	1185.55	7.330605	881.744	23.396494	13206.94	17
5645.12	1246.41	8.260505	1066.094	24.07015	13889.19	18.13
5512.87	1297.17	9.053617	1241.862	24.657717	14484.26	19.17
5396.54	1339.62	9.583136	1406.418	25.167187	15000.23	20.1
5272.19	1382.66	10.178622	1591.475	25.700441	15540.29	21.12
5172.37	1416.34	10.690466	1750.538	26.129492	15974.82	22
5046.46	1457.12	11.370498	1961.869	26.66276	16514.89	23.07
4936.87	1492.13	12.068411	2178.756	27.132723	17032.1	24.17
4843.26	1521.09	12.694996	2373.477	27.529812	17469.39	25.13
4755.38	1548.05	13.32219	2568.388	27.906473	17884.2	26.08
4675.64	1571.45	13.768641	2749.112	28.238644	18250	26.95
4580.98	1599.62	14.341268	2982.291	28.645195	18697.71	28.05
4494.81	1624.23	14.879302	3201.383	29.006302	19095.39	29.07
4405.19	1648.32	15.44337	3431.077	29.365128	19490.55	30.12
4317.17	1672.21	16.042955	3675.234	29.726038	19888	31.22
4249.69	1690.45	16.530535	3873.781	30.005178	20195.41	32.1
4171.04	1703.6	17.116545	4112.409	30.325308	20547.95	33.15
4103.98	1688.43	17.617554	4316.424	30.592163	20841.83	34.05
4020.7	1675.53	18.104879	4541.158	30.881947	21160.95	35.05
3967.31	1665.29	18.509371	4738.381	31.130783	21436.15	35.53
3893.71	1650.64	19.032047	4993.228	31.43227	21785.95	37.08
3837.38	1639.36	19.422863	5183.783	31.654278	22043.53	37.52

APPENDIX H. SCENARIO 1A RESULTS

Entire scenario run at speed ratio 6.

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Pumps on	Valves open	Time (min)
30.00392	30.00392	30.00392	45.443	5144.16146	-7E-08	none	none	0
30.07896	30.29882	29.8591	45.485	5169.15568	0.479209	none	none	1.12
30.14773	30.56952	29.72594	45.509	5192.06009	0.914299	none	none	2.12
30.22405	30.87039	29.5777	45.522	5217.47461	1.3926	B/D	C gate	3.22
30.26645	31.03774	29.49515	45.529	5231.59102	1.656264	B/D	C gate	4.15
30.3068	31.19716	29.41644	45.531	5245.02506	1.905864	B/D	C gate	5.07
30.35711	31.3961	29.31812	45.528	5261.77084	2.21521	B/D	C gate	6.2
30.40113	31.57034	29.23193	45.521	5276.42063	2.484227	B/D	C gate	7.18
30.444	31.74013	29.14788	45.517	5290.68214	2.744683	B/D	C gate	8.13
30.48797	31.91438	29.06156	45.512	5305.30305	3.010249	B/D	C gate	9.1
30.5997	32.35777	28.84162	45.484	5342.43656	3.678186	B/D	C gate	11.5
30.65039	32.55933	28.74144	45.464	5359.27087	3.978226	B/D	C gate	12.62
30.70548	32.78298	28.62798	45.444	5377.55616	4.311021	B/D	C gate	13.78
30.76829	33.04125	28.49534	45.429	5398.39135	4.69377	B/D	C gate	15.1
30.82454	33.27445	28.37464	45.413	5417.03487	5.037245	B/D/E	B/C gate	16.27
30.85304	33.38457	28.3215	45.397	5426.4737	5.194004	B/D/E	B/C gate	17.05
30.89041	33.52936	28.25145	45.374	5438.84487	5.399304	B/D/E	B/C gate	18.1
30.93078	33.68732	28.17423	45.347	5452.20372	5.622863	B/D/E	B/C gate	19.27
30.96627	33.82733	28.1052	45.323	5463.93867	5.820565	B/D/E	B/C gate	20.33
30.9899	33.92115	28.05865	45.307	5471.75113	5.952794	B/D/E	B/C gate	21.04
31.0212	34.04606	27.99635	45.285	5482.09182	6.12849	B/D/E	B/C gate	22.07
31.05243	34.1714	27.93347	45.264	5492.40394	6.304397	B/D/E	B/C gate	23.05
31.08464	34.30127	27.868	45.246	5503.0315	6.486224	B/D/E	B/C gate	24.15
31.11678	34.4315	27.80206	45.227	5513.63288	6.668027	B/D/E	B/C gate	25.28
31.14836	34.56001	27.73672	45.209	5524.04254	6.846895	B/D/E	B/C gate	26.43
31.19065	34.7329	27.6484	45.184	5537.972	7.086692	B/D/E	B/C gate	28.03
31.21949	34.85132	27.58767	45.166	5547.46469	7.250346	B/D/E	B/C gate	29.17
31.2442	34.95307	27.53533	45.151	5555.59279	7.390593	B/D/E	B/C gate	30.17
31.29276	35.15395	27.43158	45.12	5571.5544	7.666494	B/D/E	B/C gate	32.07
31.33951	35.34874	27.33027	45.091	5586.90155	7.932985	B/D/E	B/C gate	34.05
31.38377	35.53454	27.23299	45.064	5601.41968	8.186241	B/D/E	B/C gate	36.23
31.42047	35.68962	27.15132	45.041	5613.44787	8.396924	B/D/E	B/C gate	38.05
31.45748	35.84686	27.06809	45.018	5625.56331	8.6099	B/D/E	B/C gate	39.57
31.48162	35.94994	27.0133	45.003	5633.46174	8.74916	B/D/E	B/C gate	41.27
31.53096	36.16173	26.9002	44.974	5649.58884	9.034428	B/D/E	B/C gate	44.05
31.565	36.3086	26.8214	44.955	5660.70198	9.231522	B/D/E	B/C gate	46.07
31.59747	36.44928	26.74566	44.936	5671.2927	9.419689	B/D/E	B/C gate	48.07
31.63103	36.59533	26.66672	44.919	5682.23085	9.614524	B/D/E	B/C gate	50.25
31.65862	36.71598	26.60125	44.904	5691.2151	9.775079	B/D/E	B/C gate	52.05
31.68748	36.84276	26.5322	44.89	5700.60707	9.943405	B/D/E	B/C gate	54.03
31.71655	36.97098	26.46212	44.874	5710.05646	10.11324	B/D/E	B/C gate	56.1
31.75219	37.12898	26.3754	44.856	5721.63502	10.32196	B/D/E	B/C gate	58.75
31.76883	37.20301	26.33465	44.847	5727.03544	10.41953	B/D/E	B/C gate	60

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Pumps on	Valves open	Time (min)
31.80868	37.38096	26.2364	44.825	5739.95604	10.65347	B/D/E	B/C gate	63.13
31.84421	37.54044	26.14798	44.805	5751.4657	10.86242	B/D/E	B/C gate	66.05
31.88677	37.73244	26.0411	44.781	5765.23487	11.11308	B/D/E	B/C gate	69.7
31.91243	37.84864	25.97622	44.767	5773.52806	11.26432	B/D/E	B/C gate	72
31.94867	38.01344	25.88391	44.748	5785.22964	11.47825	B/D/E	B/C gate	75.32
31.98193	38.16529	25.79856	44.731	5795.95325	11.67474	B/D/E	B/C gate	78.5
32.00828	38.28604	25.73052	44.717	5804.44383	11.83054	B/D/E	B/C gate	81.07
32.03761	38.42081	25.65441	44.701	5813.88391	12.00394	B/D/E	B/C gate	84
32.07729	38.6037	25.55087	44.678	5826.63944	12.23842	B/D/E	B/C gate	88.13
32.09515	38.68627	25.50404	44.668	5832.3784	12.34393	B/D/E	B/C gate	90.03
32.13219	38.85776	25.40662	44.645	5844.2626	12.56244	B/D/E	B/C gate	94.07
32.16815	39.0239	25.3124	44.622	5855.78678	12.77285	B/D/E	B/C gate	98.1
32.2027	39.18233	25.22307	44.6	5866.84464	12.97195	B/D/E	B/C gate	102.12
32.23548	39.3321	25.13886	44.579	5877.32318	13.15905	B/D/E	B/C gate	106.1
32.26679	39.47475	25.05883	44.558	5887.3194	13.33628	B/D/E	B/C gate	110.08
32.29759	39.61473	24.98045	44.537	5897.14468	13.50927	B/D/E	B/C gate	114.18
32.32596	39.74329	24.90862	44.517	5906.18064	13.66734	B/D/E	B/C gate	118.13
32.35301	39.86562	24.8404	44.498	5914.78872	13.81707	B/D/E	B/C gate	122.08

Hull hole (gpm)	Bulkhd (gpm)	Pipe_C1 (gpm)	Pipe_B1 (gpm)	Comp_B level	Comp_B vol	Comp_C level	Comp_C Vol	Time (min)
0	0	0	0	0.04	2.78613	0.04	5.1129	0
5973.68	0	0	0	0.04	2.78613	5.30152	879.9105	1.12
6016.52	0	0	0	0.04	2.78613	7.50502	1681.565	2.12
6076.55	0	0	0	0.04	2.78613	9.56581	2571.073	3.22
6111.89	0	2291.1	0	0.04	2.78613	10.4322	3065.147	4.15
6140.17	0	2291.11	0	0.04	2.78613	11.2566	3535.339	5.07
6174.19	0	2291.11	0	0.04	2.78613	12.2843	4121.441	6.2
6205.69	0	2291.11	0	0.04	2.78613	13.1834	4634.184	7.18
6235.19	0	2291.04	0	0.04	2.78613	13.8869	5133.336	8.13
6265.27	0	2291.04	0	0.04	2.78613	14.5717	5645.068	9.1
6339.88	0	2291.04	0	0.04	2.78613	16.3109	6944.741	11.5
6374.89	147.93	2291.03	0	0.06175	4.301369	17.0973	7532.427	12.62
6412	436.98	2290.98	0	0.78277	54.52256	17.8686	8122.191	13.78
6454.48	589.58	2290.98	0	2.09265	145.7596	18.5816	8760.186	15.1
6492.47	695.09	2290.97	0	3.53605	246.2973	19.1985	9312.171	16.27
6509.43	757.25	2297.07	1139.01	3.00041	208.9884	19.6094	9679.839	17.05
6498.04	831.19	2338.1	1098.03	2.35051	163.7204	20.1439	10158.1	18.1
6371.98	902.1	2374	1062.19	1.87705	130.7423	20.7033	10658.64	19.27
6262.39	958.53	2398.93	1037.3	1.63554	113.9205	21.1812	11086.18	20.33
6191.28	993.59	2412.17	1024.08	1.55969	108.6378	21.4927	11364.9	21.04
6096.83	1037.4	2425.95	1010.36	1.5583	108.5407	21.8973	11726.92	22.07
6006.09	1077.6	2435.41	1000.91	1.66386	115.8935	22.2842	12080.49	23.05
5924.78	1113	2440.33	996.005	1.86989	130.2438	22.6374	12438.11	24.15
5845.16	1146.6	2442.02	994.334	2.16434	150.7529	22.9835	12788.65	25.28
5767.35	1178.2	2440.71	995.66	2.53537	176.597	23.3177	13127.14	26.43

Hull hole (gpm)	Bulkhd (gpm)	Pipe_C1 (gpm)	Pipe_B1 (gpm)	Comp_B level	Comp_B vol	Comp_C level	Comp_C Vol	Time (min)
5664.19	1218.5	2434.63	1001.77	3.15133	219.5002	23.7567	13571.77	28.03
5594.78	1244.7	2427.79	1008.61	3.64496	253.883	24.0508	13869.63	29.17
5419.66	1307.4	2416.87	1019.44	4.69777	359.7905	24.7788	14606.86	32.07
5311.45	1344.3	2417.32	1019	5.12959	445.3986	25.2246	15058.4	34.05
5211.87	1377.3	2414.85	1021.47	5.60892	540.424	25.6325	15471.51	36.23
5131.84	1403.2	2410.66	1025.67	6.0586	629.5717	25.9602	15803.35	38.05
5052.74	1428	2404.49	1031.84	6.55913	728.8015	26.2809	16128.16	39.57
5002.8	1443.7	2399.41	1036.92	6.91127	798.6118	26.4849	16334.8	41.27
4909.77	1472.8	2385.77	1050.56	7.69115	953.2204	26.8717	16744.64	44.05
4850.66	1491.2	2374.22	1062.1	8.2704	1068.055	27.1206	17018.76	46.07
4795.97	1508.2	2361.98	1074.35	8.85267	1183.49	27.3524	17274	48.07
4740.81	1525.1	2355.53	1080.76	9.27196	1309.716	27.5854	17530.61	50.25
4697.37	1538.4	2349.67	1086.62	9.62547	1419.573	27.7712	17735.2	52.05
4651.81	1551.9	2342.71	1093.59	10.0138	1540.267	27.9601	17943.23	54.03
4612.48	1564.9	2334.85	1101.44	10.4237	1667.634	28.1447	18146.59	56.1
4563.09	1580.2	2324.08	1112.21	10.9515	1831.649	28.3638	18387.82	58.75
4541.02	1587.1	2318.65	1117.64	11.2069	1911.027	28.4634	18497.46	60
4490.46	1603	2304.67	1131.62	11.8413	2108.168	28.695	18752.54	63.13
4448.23	1616.6	2291.52	1144.76	12.433	2292.073	28.8938	18971.47	66.05
4400.61	1632.1	2275.03	1161.25	13.1741	2522.375	29.1223	19223.09	69.7
4373.47	1641	2266.13	1170.14	13.5645	2665.986	29.2554	19369.74	72
4338.14	1653.1	2254.49	1181.78	14.0802	2875.963	29.4367	19569.32	75.32
4308	1663.7	2242.99	1193.28	14.5697	3075.326	29.5964	19745.29	78.5
4285.67	1671.7	2233.38	1202.89	14.9681	3237.526	29.719	19880.26	81.07
4262.46	1680.4	2222.21	1214.06	15.421	3421.962	29.8515	20026.22	84
4232.94	1691.7	2206.38	1229.89	16.0483	3677.427	30.025	20217.2	88.13
4220.65	1696.7	2199.01	1237.25	16.3357	3794.429	30.1011	20301.06	90.03
4196.11	1706.6	2183.36	1252.9	16.9403	4040.626	30.2553	20470.81	94.07
4171.47	1683	2168.89	1267.37	17.5173	4275.621	30.4081	20639.16	98.1
4141.86	1661.7	2157.88	1278.37	17.9986	4489.332	30.5655	20812.48	102.12
4143.02	1645	2149.36	1286.89	18.4032	4686.612	30.7194	20981.95	106.1
4081.76	1629.7	2141.62	1294.63	18.7815	4871.085	30.8696	21147.34	110.08
4048.33	1615.3	2134.39	1301.86	19.1458	5048.702	31.0206	21313.61	114.18
4020.45	1602.3	2127.95	1308.29	19.4746	5209.031	31.1596	21469.54	118.13
3993.51	1590.1	2121.92	1314.32	19.783	5359.367	31.2897	21620.49	122.08

APPENDIX I. SCENARIO 1B RESULTS

Scenario 1B was run at 2 speed ratios.

Speed ratio	Time(min)
6	0
3	31.97
6	99.97

Speed ratio was slowed to allow time to regulate gate valves during simulation.

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Valves open	Pumps on	Time (min)
30.07896	30.29882	29.8591	45.485	5169.1557	0.4792	none	None	1.12
30.14773	30.56952	29.72594	45.509	5192.0601	0.9143	none	None	2.12
30.22405	30.87039	29.5777	45.522	5217.4746	1.3926	C gate	B/D	3.22
30.26645	31.03774	29.49515	45.529	5231.591	1.6563	C gate	B/D	4.15
30.3068	31.19716	29.41644	45.531	5245.02506	1.9059	C gate	B/D	5.07
30.35711	31.3961	29.31812	45.528	5261.7708	2.2152	C gate	B/D	6.2
30.40113	31.57034	29.23193	45.521	5276.4206	2.4842	C gate	B/D	7.18
30.444	31.74013	29.14788	45.517	5290.6821	2.7447	C gate	B/D	8.13
30.48797	31.91438	29.06156	45.512	5305.303	3.0102	C gate	B/D	9.1
30.5997	32.35777	28.84162	45.484	5342.4366	3.6782	C gate	B/D	11.5
30.65039	32.55933	28.74144	45.464	5359.2709	3.9782	C gate	B/D	12.62
30.70548	32.78298	28.62798	45.444	5377.5562	4.311	C gate	B/D	13.78
30.76829	33.04125	28.49534	45.429	5398.3914	4.6938	C gate	B/D	15.1
30.82454	33.27445	28.37464	45.413	5417.0349	5.0372	B/C gate	B/D/E	16.27
30.85304	33.38457	28.3215	45.397	5426.4737	5.194	B/C gate	B/D/E	17.05
30.89041	33.52936	28.25145	45.374	5438.8449	5.3993	B/C gate	B/D/E	18.1
30.93078	33.68732	28.17423	45.347	5452.2037	5.6229	B/C gate	B/D/E	19.27
30.96627	33.82733	28.1052	45.323	5463.9387	5.8206	B/C gate	B/D/E	20.33
30.9899	33.92115	28.05865	45.307	5471.7511	5.9528	B/C gate	B/D/E	21.04
31.0212	34.04606	27.99635	45.285	5482.0918	6.1285	B/C gate	B/D/E	22.07
31.05639	34.18733	27.92545	45.262	5493.7104	6.3267	B/C gate	B/D/E	23.18
31.0841	34.29857	27.86963	45.245	5502.8539	6.4821	B(100%)/C(30%)	B/D/E	24
31.11248	34.41194	27.81302	45.228	5512.2152	6.6395	B(100%)/C(24%)	B/D/E	25
31.13866	34.51646	27.76087	45.21	5520.8462	6.784	B(100%)/C(22%)	B/D/E	25.53
31.16804	34.63365	27.70242	45.19	5530.5241	6.9453	B(100%)/C(19%)	B/D/E	26
31.19301	34.73329	27.65274	45.172	5538.7495	7.0819	B(100%)/C(18%)	B/D/E	27
31.21516	34.82167	27.60866	45.155	5546.0391	7.2027	B(100%)/C(17%)	B/D/E	27.97
31.24187	34.92818	27.55555	45.135	5554.824	7.3477	B(100%)/C(16%)	B/D/E	28.97
31.26493	35.02021	27.50965	45.116	5562.4077	7.4725	B(100%)/C(15%)	B/D/E	29.95
31.30843	35.19322	27.42363	45.08	5576.6991	7.7057	B(100%)/C(13%)	B/D/E	31.97
31.35106	35.36325	27.33888	45.043	5590.6947	7.9337	B(100%)/C(12%)	B/D/E	34
31.39043	35.52055	27.26031	45.007	5603.6053	8.1436	B(100%)/C(12%)	B/D/E	36.05
31.425	35.65866	27.19134	44.975	5614.9309	8.3269	B(100%)/C(11%)	B/D/E	37.97
31.45833	35.79165	27.12501	44.945	5625.8424	8.5025	B(100%)/C(11%)	B/D/E	39.95
31.48998	35.9182	27.06177	44.918	5636.1969	8.669	B(100%)/C(10%)	B/D/E	41.97
31.51879	36.03275	27.00482	44.892	5645.611	8.8186	B(100%)/C(10%)	B/D/E	43.88

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Valves open	Pumps on	Time (min)
31.54652	36.14372	26.94933	44.867	5654.6699	8.9635	B(100%)/C(10%)	B/D/E	45.97
31.57236	36.2477	26.89702	44.845	5663.1038	9.099	B(100%)/C(10%)	B/D/E	48
31.597	36.34654	26.84747	44.822	5671.1425	9.2272	B(100%)/C(9%)	B/D/E	50.08
31.61996	36.43783	26.80209	44.799	5678.6258	9.3447	B(100%)/C(9%)	B/D/E	52.18
31.63936	36.51542	26.76331	44.781	5684.9467	9.4446	B(100%)/C(9%)	B/D/E	54.1
31.65787	36.58982	26.72592	44.763	5690.9721	9.5403	B(100%)/C(9%)	B/D/E	56.07
31.67416	36.65374	26.69457	44.745	5696.2729	9.6215	B(100%)/C(8%)	B/D/E	57.93
31.69691	36.74438	26.64945	44.722	5703.675	9.737	B(35%)/C(8%)	B/D/E	60.7
31.70799	36.7896	26.62638	44.712	5707.2766	9.7952	B(30%)/C(8%)	B/D/E	62.1
31.72098	36.84147	26.60049	44.698	5711.4977	9.8611	B(30%)/C(8%)	B/D/E	64
31.7336	36.89213	26.57507	44.686	5715.5978	9.9255	B(30%)/C(8%)	B/D/E	66.03
31.74487	36.93759	26.55215	44.674	5719.2573	9.9834	B(30%)/C(8%)	B/D/E	68
31.76244	37.00856	26.51632	44.657	5724.9611	10.074	B(30%)/C(8%)	B/D/E	71
31.78258	37.09092	26.47424	44.639	5731.4953	10.179	B(100%)/C(8%)	B/D/E	75.5
31.78474	37.09967	26.46981	44.636	5732.1951	10.19	B(30%)/C(7%)	B/D/E	76.1
31.79493	37.13941	26.45044	44.624	5735.4998	10.239	B(25%)/C(7%)	B/D/E	78.55
31.79992	37.15848	26.44137	44.617	5737.1195	10.262	B(25%)/C(7%)	B/D/E	80.03
31.80587	37.18124	26.4305	44.609	5739.0468	10.29	B(25%)/C(7%)	B/D/E	81.97
31.81168	37.20356	26.4198	44.601	5740.9299	10.318	B(25%)/C(7%)	B/D/E	84.08
31.81756	37.22758	26.40754	44.596	5742.8341	10.348	B(25%)/C(7%)	B/D/E	86.07
31.82188	37.24427	26.3995	44.59	5744.2354	10.369	B(25%)/C(7%)	B/D/E	88
31.82634	37.26153	26.39115	44.584	5745.6787	10.39	B(23%)/C(7%)	B/D/E	90.18
31.83617	37.30461	26.36773	44.579	5748.863	10.446	B(23%)/C(7%)	B/D/E	93
31.84153	37.32555	26.35751	44.573	5750.5977	10.472	B(23%)/C(7%)	B/D/E	96.5
31.84648	37.34547	26.3475	44.567	5752.2018	10.497	B(23%)/C(7%)	B/D/E	99.97
31.85087	37.36284	26.33889	44.562	5753.6205	10.519	B(24%)/C(7%)	B/D/E	104.07
31.85436	37.37672	26.33199	44.558	5754.75	10.536	B(25%)/C(7%)	B/D/E	108.07
31.85727	37.3882	26.32633	44.555	5755.6924	10.55	B(25%)/C(7%)	B/D/E	112.08
31.85969	37.39786	26.32152	44.552	5756.4775	10.562	B(26%)/C(7%)	B/D/E	116.17
31.86182	37.4063	26.31735	44.549	5757.1659	10.573	B(28%)/C(7%)	B/D/E	120.57
31.86323	37.41173	26.31474	44.547	5757.6223	10.579	B(29%)/C(7%)	B/D/E	124.15
31.86518	37.41913	26.31122	44.545	5758.2517	10.588	B(29%)/C(7%)	B/D/E	130
31.86629	37.42341	26.30917	44.543	5758.6118	10.594	B(29%)/C(7%)	B/D/E	136.08
31.86723	37.42707	26.3074	44.542	5758.9169	10.598	B(29%)/C(7%)	B/D/E	142.25
31.86772	37.42897	26.30646	44.541	5759.0742	10.6	B(29%)/C(7%)	B/D/E	146.45
31.86809	37.43046	26.30573	44.541	5759.1955	10.602	B(29%)/C(7%)	B/D/E	150.37
31.86829	37.43123	26.30535	44.541	5759.258	10.603	B(29%)/C(7%)	B/D/E	152.75
31.86875	37.43299	26.30451	44.54	5759.4069	10.605	B(30%)/C(7%)	B/D/E	160.08
31.86897	37.4338	26.30414	44.54	5759.479	10.606	B(30%)/C(7%)	B/D/E	165.25
31.86912	37.43435	26.30389	44.54	5759.5277	10.607	B(30%)/C(7%)	B/D/E	170.12
31.86923	37.43477	26.3037	44.539	5759.5644	10.608	B(30%)/C(7%)	B/D/E	175.04
31.86934	37.43516	26.30352	44.539	5759.5977	10.608	B(30%)/C(7%)	B/D/E	181
31.86938	37.43532	26.30344	44.539	5759.6123	10.608	B(30%)/C(7%)	B/D/E	185.25
31.86943	37.43548	26.30337	44.539	5759.6264	10.608	B(30%)/C(7%)	B/D/E	190.1
31.86947	37.43565	26.3033	44.539	5759.6413	10.609	B(30%)/C(7%)	B/D/E	195.6
31.86949	37.4357	26.30327	44.539	5759.6464	10.609	B(30%)/C(7%)	B/D/E	200.66
31.86948	37.43567	26.30329	44.539	5759.6444	10.609	B(30%)/C(7%)	B/D/E	205.12

Hull hole (gpm)	Bulkhd (gpm)	Pipe_C1 (gpm)	Pipe_B1 (gpm)	Comp_B level	Comp_B vol	Comp_C level	Comp_C vol	Time (min)
0	0	0	0	0.04	2.78613	0.04	5.1129	0
5973.68	0	0	0	0.04	2.78613	5.301516	879.9105	1.12
6016.52	0	0	0	0.04	2.78613	7.505018	1681.565	2.12
6076.55	0	0	0	0.04	2.78613	9.565808	2571.073	3.22
6111.89	0	2291.1	0	0.04	2.78613	10.43216	3065.147	4.15
6140.17	0	2291.11	0	0.04	2.78613	11.25663	3535.339	5.07
6174.19	0	2291.11	0	0.04	2.78613	12.28435	4121.441	6.2
6205.69	0	2291.11	0	0.04	2.78613	13.18343	4634.184	7.18
6235.19	0	2291.04	0	0.04	2.78613	13.8869	5133.336	8.13
6265.27	0	2291.04	0	0.04	2.78613	14.57169	5645.068	9.1
6339.88	0	2291.04	0	0.04	2.78613	16.31089	6944.741	11.5
6374.89	147.925	2291.03	0	0.06175	4.301369	17.09732	7532.427	12.62
6412	436.978	2290.98	0	0.78277	54.52256	17.86861	8122.191	13.78
6454.48	589.581	2290.98	0	2.09265	145.7596	18.58163	8760.186	15.1
6492.47	695.09	2290.97	0	3.53605	246.2973	19.19853	9312.171	16.27
6509.43	757.254	2297.07	1139.01	3.00041	208.9884	19.60944	9679.839	17.05
6498.04	831.19	2338.1	1098.03	2.35051	163.7204	20.14395	10158.1	18.1
6371.98	902.102	2374	1062.19	1.87705	130.7423	20.70335	10658.64	19.27
6262.39	958.528	2398.93	1037.3	1.63554	113.9205	21.18117	11086.18	20.33
6191.28	993.588	2412.17	1024.08	1.55969	108.6378	21.49267	11364.9	21.04
6096.83	1037.36	2425.95	1010.36	1.5583	108.5407	21.89727	11726.92	22.07
5992.22	1082.01	2436.19	1000.13	1.68422	117.3116	22.32799	12124.8	23.18
5913.99	1112.96	2327.75	1108.4	1.78396	124.2583	22.63712	12437.88	24
5853.86	1144.4	2281.59	1154.59	1.79161	124.7915	22.96011	12764.99	25
5782.88	1172.72	2263.61	1172.6	1.78594	124.3967	23.25878	13067.47	25.53
5699.31	1203.76	2218.34	1217.84	1.76655	123.0456	23.59457	13407.54	26
5629.18	1229.57	2201.3	1234.89	1.74451	121.5107	23.88035	13696.97	27
5566.68	1251.98	2179.72	1256.48	1.72813	120.37	24.1334	13953.25	27.97
5488.56	1278.51	2155.85	1280.29	1.69851	118.3068	24.43903	14262.78	28.97
5422.62	1300.96	2125.96	1310.28	1.67695	116.8051	24.7026	14529.71	29.95
5291.05	1342.75	2050.04	1386.18	1.54784	107.8121	25.20537	15038.9	31.97
5161.05	1382.11	2062.71	1373.54	1.48348	103.3294	25.69347	15533.23	34
5038.51	1417.21	2016.4	1419.84	1.46904	102.3232	26.14064	15986.11	36.05
4929.93	1447.31	1959.61	1476.61	1.45376	101.259	26.53309	16383.57	37.97
4828.72	1474.39	1967.81	1468.44	1.41308	98.42529	26.89319	16768.31	39.95
4735.48	1498.7	1898.14	1538.06	1.41533	98.58241	27.22213	17130.56	41.97
4646.73	1520.89	1905.52	1530.52	1.32486	92.28101	27.52705	17466.35	43.88
4561.29	1541.48	1910.85	1525.39	1.33925	93.28327	27.81405	17782.41	45.97
4484.65	1559.99	1913.78	1522.48	1.44541	100.6774	28.07538	18070.21	48
4408.03	1577.67	1828.69	1607.52	1.49445	104.0935	28.32776	18348.14	50.08
4332.07	1594.47	1834.21	1602.01	1.42065	98.95256	28.57026	18615.2	52.18
4268.86	1608.23	1837.61	1598.62	1.42549	99.28976	28.77085	18836.09	54.1
4209.53	1620.98	1839.73	1596.51	1.49078	103.8375	28.95821	19042.43	56.07
4149.83	1633.13	1741.96	1694.22	1.30898	91.17486	29.13818	19240.63	57.93
4070.66	1649.09	1766.19	1670.02	1.25934	87.71707	29.37658	19503.16	60.7
4036.62	1656.09	1772.71	1663.51	1.40418	97.8057	29.48188	19619.12	62.1
3990.99	1664.99	1774.85	1661.38	1.39783	97.36343	29.61644	19767.3	64
3947.45	1673.43	1776.28	1659.95	1.43156	99.71289	29.74461	19908.46	66.03

Hull hole (gpm)	Bulkhd (gpm)	Pipe_C1 (gpm)	Pipe_B1 (gpm)	Comp_B level	Comp_B vol	Comp_C level	Comp_C vol	Time (min)
3909.25	1680.77	1776.98	1659.26	1.49756	104.31	29.85674	20031.94	68
3849.5	1692.1	1777.86	1658.39	1.61293	112.346	30.03072	20223.54	71
3784.31	1704.36	1749.66	1686.58	1.90111	132.4183	30.22017	20432.16	75.5
3775.2	1705.72	1749.69	1686.54	1.92005	133.7376	30.24121	20455.34	76.1
3734.43	1713.08	1671.44	1764.74	1.76988	123.2778	30.35574	20581.46	78.55
3711.38	1716.93	1674.08	1762.1	1.63224	113.6907	30.41592	20647.74	80.03
3684.03	1721.46	1677.08	1759.12	1.47895	103.0133	30.48687	20725.87	81.97
3653.73	1725.84	1679.83	1756.37	1.34089	93.39719	30.55545	20801.4	84.08
3635.86	1729.35	1679.21	1755.88	1.42323	99.13271	30.61076	20862.31	86.07
3618.12	1732.55	1681.35	1754.85	1.33224	92.79495	30.66105	20917.69	88
3598.24	1735.78	1685.01	1753.8	1.24899	86.99592	30.71219	20974.01	90.18
3578.83	1739.85	1682.66	1753.55	1.83321	127.689	30.77644	21044.76	93
3552.74	1743.61	1684.42	1751.8	1.76063	122.6338	30.83616	21110.53	96.5
3536.68	1746.75	1684.82	1751.39	1.77963	123.9572	30.88594	21165.35	99.97
3518.53	1749.66	1685.71	1750.51	1.75886	122.5105	30.93234	21216.46	104.1
3504.39	1751.96	1682.95	1753.27	1.74854	121.7914	30.9689	21256.71	108.1
3492.01	1753.92	1680.61	1755.6	1.72579	120.2072	31.00029	21291.28	112.1
3482.13	1755.51	1681.02	1755.2	1.72086	119.8634	31.02555	21319.1	116.2
3473.29	1756.91	1678.69	1757.53	1.71072	119.157	31.04807	21343.9	120.6
3466.59	1757.95	1674.52	1761.69	1.67941	116.9765	31.06455	21362.05	124.2
3456.74	1759.42	1673.5	1762.71	1.62321	113.062	31.08811	21387.99	130
3451.17	1760.24	1674.04	1762.18	1.59662	111.2098	31.10124	21402.45	136.1
3447.19	1760.9	1674.4	1761.81	1.58024	110.069	31.11193	21414.27	142.3
3444.95	1761.22	1674.67	1761.67	1.57486	109.6939	31.117	21420.15	146.5
3443.62	1761.46	1674.62	1761.59	1.57271	109.5441	31.12078	21424.55	150.4
3443.15	1761.57	1674.65	1761.57	1.57244	109.5252	31.12269	21426.75	152.8
3440.74	1761.9	1672.97	1763.24	1.56049	108.6933	31.12789	21432.79	160.1
3439.51	1762.08	1673.16	1763.05	1.54909	107.8993	31.13075	21436.12	165.3
3438.68	1762.2	1673.3	1762.92	1.54124	107.3524	31.13269	21438.36	170.1
3438.04	1762.29	1673.4	1762.82	1.53535	106.9422	31.13415	21440.06	175
3437.55	1762.36	1673.45	1762.76	1.53239	106.7358	31.13534	21441.43	181
3437.24	1762.4	1673.5	1762.72	1.52951	106.5353	31.13595	21442.14	185.3
3437.04	1762.44	1673.54	1762.67	1.52694	106.3565	31.13653	21442.82	190.1
3436.76	1762.47	1673.58	1762.64	1.52485	106.2104	31.13711	21443.48	195.6
3436.67	1762.49	1673.6	1762.62	1.52347	106.1145	31.13734	21443.76	200.7
3436.66	1762.49	1673.61	1762.6	1.52243	106.0425	31.13734	21443.76	205.1

APPENDIX J. SCENARIO 2 RESULTS

Entire scenario run at speed ratio of 6.

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Time (min)
30.00392	30.00392	30.00392	45.44269	5144.16146	-7E-08	0
30.07087	30.19887	29.94287	45.48026	5166.4613	0.279379	1
30.14493	30.4146	29.87526	45.50469	5191.12593	0.585588	2.08
30.21152	30.60864	29.81439	45.51614	5213.30164	0.858425	3.03
30.28538	30.82397	29.7468	45.52234	5237.89631	1.158321	4.12
30.35275	31.02041	29.68509	45.51475	5260.32124	1.429316	5.08
30.42635	31.23506	29.61764	45.50702	5284.80956	1.722619	6.13
30.50394	31.46138	29.54649	45.49115	5310.61259	2.028742	7.25
30.5666	31.6442	29.48899	45.46983	5331.44034	2.273678	8.13
30.63552	31.84483	29.42622	45.44589	5354.33606	2.539752	9.08
30.70726	32.05304	29.36148	45.43274	5378.14781	2.812942	10.08
~~30.78303~~	32.27262	29.29344	45.41717	5403.27764	3.098014	11.13
30.86723	32.51626	29.21819	45.39691	5431.17217	3.410767	12.3
30.93291	32.70606	29.15976	45.37857	5452.90959	3.651828	13.25
31.00938	32.92671	29.09205	45.35415	5478.18665	3.929275	14.3
31.09575	33.1755	29.016	45.33202	5506.69813	4.238613	15.6
31.16058	33.36196	28.9592	45.31588	5528.06909	4.468051	16.6
31.22619	33.5504	28.90199	45.30234	5549.66903	4.697871	17.68
31.28538	33.72014	28.85061	45.28953	5569.12693	4.90314	18.58
31.36167	33.93866	28.78468	45.2721	5594.17489	5.164957	19.88
31.43431	34.14636	28.72226	45.25444	5617.98045	5.411298	21.1
31.49778	34.32756	28.668	45.23797	5638.74633	5.624235	22.18
31.55444	34.4891	28.61978	45.22233	5657.25677	5.812532	23.17
31.61497	34.66142	28.56852	45.20586	5676.99949	6.011817	24.25
31.6644	34.80193	28.52687	45.19426	5693.09767	6.173143	25.11
31.72239	34.96657	28.47822	45.18021	5711.95615	6.360813	26.17
31.77148	35.10572	28.43723	45.16848	5727.89314	6.518314	27.07
31.82993	35.27121	28.38866	45.15581	5746.84319	6.704312	28.15
31.88068	35.41469	28.34668	45.14405	5763.26708	6.864408	29.1
31.93364	35.56422	28.30307	45.1309	5780.37814	7.030124	30.1
32.0391	35.86135	28.21686	45.10673	5814.36485	7.356059	32.12
32.14388	36.15569	28.13206	45.08404	5848.00952	7.674586	34.15
32.24566	36.44084	28.05047	45.0594	5880.57372	7.979067	36.15
32.3498	36.73174	27.96786	45.038	5913.76872	8.285682	38.22
32.44315	36.99177	27.89453	45.01821	5943.41148	8.55635	40.08
32.545	37.27472	27.81529	44.99446	5975.63033	8.847253	42.13
32.64728	37.55803	27.73653	44.96796	6007.84921	9.134824	44.2
32.75424	37.85346	27.65502	44.9371	6041.39625	9.430792	46.37
32.83724	38.0821	27.59239	44.91077	6067.32177	9.65715	48.05
32.94651	38.38207	27.51094	44.87272	6101.30576	9.950476	50.27
33.08795	38.76719	27.40871	44.83372	6145.04696	10.3203	53.13
33.18921	39.04081	27.33761	44.80618	6176.18538	10.57844	55.18
33.28229	39.29082	27.27376	44.7789	6204.67483	10.81096	57.07
33.4308	39.68674	27.17486	44.73147	6249.86242	11.17272	60.07
33.53823	39.97085	27.10561	44.69427	6282.34158	11.42748	62.13

Hull hole (gpm)	Bulkhd Fwd (gpm)	Bulkhd Aft (gpm)	Comp_C level	Comp_C Vol	Comp_D level	Comp_D vol	Comp_E level	Comp_E vol	Time (min)
0	0	0	0.04	5.1129	0.04	4.583704	0.04	8.381344	0
5944.1	0	0	0.04	5.1129	5.290003	785.0779	0.04	8.381344	1
5963.62	0	0	0.04	5.1129	7.936844	1648.34	0.04	8.381344	2.08
6023.11	0	0	0.04	5.1129	9.799664	2424.49	0.04	8.381344	3.03
6050.1	0	0	0.04	5.1129	11.48338	3285.303	0.04	8.381344	4.12
6087.3	0	0	0.04	5.1129	13.01855	4070.176	0.04	8.381344	5.08
6124.96	0	0	0.04	5.1129	14.37249	4927.267	0.04	8.381344	6.13
6157.73	0	0	0.04	5.1129	15.72056	5830.373	0.04	8.381344	7.25
6186.69	0	0	0.04	5.1129	16.80869	6559.344	0.04	8.381344	8.13
6217.18	441.274	441.274	0.296791	37.93656	17.8856	7295.047	0.196651	41.205	9.08
6250.78	619.355	619.355	0.859067	109.808	18.74538	7984.715	0.539658	113.0766	10.08
6282.16	755.872	755.872	1.61835	206.8616	19.59988	8670.152	1.002847	210.1302	11.13
6179.04	876.789	876.789	2.618097	334.6516	20.49837	9390.881	1.612726	337.9203	12.3
6018.43	956.239	956.239	3.514359	449.2141	21.1612	9922.565	2.159476	452.4828	13.25
5837.24	1036.87	1037.87	4.527233	598.2191	21.8926	10509.25	2.870602	601.4876	14.3
5656.25	1111.07	1111.07	5.041433	785.2899	22.61801	11133.01	3.763399	788.5587	15.6
5534.31	1158.46	1158.46	5.458658	937.0801	23.10749	11577.42	4.459684	940.3486	16.6
5415.18	1202.5	1202.5	5.907113	1100.233	23.58075	12007.11	4.733262	1103.501	17.68
5311.47	1239.26	1239.26	6.333456	1255.34	23.98917	12377.92	4.99335	1258.609	18.58
5183.18	1282.92	1282.92	6.912946	1466.164	24.49035	12832.95	5.346866	1469.433	19.88
5055.75	1320.98	1320.98	7.495207	1677.996	24.94141	13242.48	5.702071	1681.264	21.1
4973.85	1351.73	1351.73	8.027297	1871.575	25.3155	13582.13	6.026669	1874.843	22.18
4881.77	1377.36	1377.36	8.52043	2050.981	25.63387	13871.18	6.327502	2054.25	23.17
4804.19	1402.99	1402.99	9.001486	2249.244	25.9582	14165.65	6.659953	2252.512	24.25
4738.8	1422.67	1422.67	9.294055	2416.094	26.21123	14395.39	6.939737	2419.365	25.11
4665.28	1444.41	1444.41	9.646928	2617.335	26.49491	14652.95	7.277182	2620.605	26.17
4608.44	1461.39	1461.39	9.953486	2792.164	26.71954	14861.09	7.570338	2795.434	27.07
4550.73	1479.36	1479.36	10.3269	3005.117	26.95995	15098.43	7.927425	3008.387	28.15
4502.47	1494.12	1494.12	10.65798	3193.932	27.15969	15295.64	8.244039	3197.205	29.1
4452.76	1508.75	1508.75	11.00993	3394.649	27.35969	15493.09	8.580609	3397.924	30.1
4369.87	1535.7	1535.7	11.72962	3805.083	27.73312	15861.76	9.131269	3808.358	32.12
4296.02	1559.86	1559.86	12.46741	4225.841	28.0735	16197.8	9.581355	4229.118	34.15
4232.9	1581.11	1581.11	13.20373	4645.757	28.37728	16497.71	10.03054	4649.035	36.15
4178.28	1600.88	1600.88	13.82265	5085.327	28.66362	16780.4	10.50075	5088.606	38.22
4134.88	1617.1	1617.1	14.35994	5486.835	28.90113	17014.88	10.93024	5490.112	40.08
4100.22	1633.32	1633.32	14.95596	5932.226	29.14106	17251.76	11.40667	5935.503	42.13
4065.9	1648.31	1648.31	15.56257	6385.536	29.36495	17472.8	11.89158	6388.816	44.2
4039.79	1662.77	1662.77	16.20425	6865.047	29.58285	17687.92	12.40451	6868.325	46.37
4021.77	1673.23	1673.23	16.70651	7240.377	29.74161	17844.65	12.80601	7243.657	48.05
4005.88	1661.92	1686.22	17.36981	7736.055	29.94018	18040.7	13.33721	7741.373	50.27
3975.59	1627.47	1702.76	18.14084	8365.777	30.19534	18292.6	13.86728	8390.691	53.13
3967.1	1606.12	1714.39	18.63594	8808.779	30.37629	18471.25	14.24949	8858.886	55.18
3953.06	1586.53	1724.9	19.08503	9210.608	30.54077	18633.63	14.6029	9291.803	57.07
3931.65	1555.47	1741.38	19.78905	9840.551	30.80069	18890.24	15.17028	9986.818	60.07
3915.74	1533.14	1753.07	20.28887	10287.77	30.98657	19073.75	15.58338	10492.86	62.13

APPENDIX K. SCENARIO 3 RESULTS

Scenario 3 was run at 3 speed ratios.

Speed ratio	Time (min)
6	0
10	90.6
15	216

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Time (min)
30.00392	30.00392	30.00392	45.44269	5144.16146	-7E-08	0
30.08333	30.05412	30.11254	45.48539	5170.61126	-0.06378	1.18
30.17899	30.11468	30.2433	45.50741	5202.47055	-0.13973	2.58
30.27981	30.17859	30.38103	45.51641	5236.04088	-0.21877	4.05
30.34774	30.2217	30.47378	45.50684	5258.65295	-0.27144	5.05
30.41705	30.26574	30.56837	45.49979	5281.71700	-0.32469	6
30.48897	30.31148	30.66645	45.4821	5305.63494	-0.37943	7.05
30.56468	30.3608	30.76855	45.45289	5330.80232	-0.43413	8.15
30.63012	30.40803	30.85222	45.43327	5352.54349	-0.47136	9.08
30.70051	30.46122	30.9398	45.41142	5375.90943	-0.50606	10.08
30.7686	30.51445	31.02276	45.38618	5398.49505	-0.53566	11.05
30.83893	30.57134	31.10651	45.35617	5421.80025	-0.56201	12.08
30.9032	30.62504	31.18136	45.32523	5443.07939	-0.58237	13.07
30.96509	30.67821	31.25196	45.29971	5463.54899	-0.59881	14.05
31.02772	30.73343	31.322	45.27152	5484.24351	-0.61243	15.08
31.08327	30.7836	31.38295	45.24514	5502.58197	-0.62199	16.03
31.1415	30.83745	31.44556	45.2189	5521.7825	-0.62934	17.07
31.19666	30.88969	31.50363	45.19311	5539.94965	-0.63373	18.08
31.24722	30.93867	31.55576	45.16882	5556.58316	-0.63548	19.05
31.29845	30.98943	31.60746	45.14366	5573.42145	-0.63494	20.07
31.34693	31.03859	31.65528	45.11948	5589.33941	-0.63215	21.07
31.39368	31.08702	31.70033	45.09903	5604.6688	-0.62735	22.07
31.43811	31.134	31.74223	45.08003	5619.22442	-0.62091	23.05
31.48252	31.1819	31.78314	45.06076	5633.75616	-0.61257	24.07
31.52472	31.22835	31.8211	45.04219	5647.55118	-0.60279	25.07
31.56489	31.27342	31.85636	45.02426	5660.66541	-0.59177	26.05
31.6044	31.31863	31.89017	45.00635	5673.55389	-0.5792	27.05
31.64449	31.36543	31.92355	44.98789	5686.6165	-0.56461	28.1
31.68143	31.40941	31.95345	44.97054	5698.63813	-0.5495	29.1
31.71779	31.45354	31.98205	44.95764	5710.46184	-0.53299	30.12
31.78502	31.53736	32.03268	44.93537	5732.2866	-0.49813	32.08
31.84913	31.62004	32.07823	44.91523	5753.05999	-0.45958	34.07
31.91062	31.70216	32.11908	44.89709	5772.9443	-0.41714	36.08
31.96733	31.78014	32.15451	44.88092	5791.2456	-0.37372	38.03
32.02472	31.861	32.18845	44.86457	5809.73762	-0.32615	40.08
32.07795	31.93798	32.21792	44.84949	5826.85186	-0.27826	42.07

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Time (min)
32.12956	32.01411	32.24501	44.83432	5843.41888	-0.22907	44.05
32.18005	32.08967	32.27043	44.81845	5859.59625	-0.17897	46.03
32.22938	32.16463	32.29414	44.80442	5875.37457	-0.128	48
32.28068	32.24315	32.31821	44.7949	5891.75272	-0.07405	50.1
32.33083	32.32068	32.34099	44.78546	5907.73238	-0.01999	52.17
32.37672	32.3919	32.36154	44.77599	5922.32784	0.029839	54.07
32.42361	32.46533	32.3819	44.76562	5937.21587	0.081808	56.03
32.47109	32.53996	32.40222	44.75404	5952.2623	0.134757	58.03
32.51928	32.61588	32.42269	44.741	5967.50736	0.188578	60.07
32.56802	32.69262	32.44343	44.72635	5982.8929	0.242685	62.12
32.62368	32.7802	32.46715	44.7078	6000.42569	0.304084	64.45
32.66718	32.84896	32.48541	44.69217	6014.10259	0.352423	66.28
32.71612	32.92584	32.5064	44.67287	6029.45694	0.405672	68.33
32.75989	32.99416	32.52561	44.6541	6043.16177	0.452258	70.17
32.80696	33.06747	32.54645	44.63889	6057.87371	0.501826	72.15
32.85446	33.14139	32.56753	44.62348	6072.68632	0.551516	74.17
32.99738	33.3618	32.63295	44.57041	6117.06994	0.69595	80.25
33.22867	33.71623	32.74111	44.46686	6188.2787	0.921558	90.6
33.44703	34.04876	32.84531	44.35038	6254.78127	1.126493	100.5
33.66113	34.37343	32.94883	44.24648	6319.27971	1.321328	110.5
33.86815	34.68612	33.05018	44.1355	6380.9623	1.504164	120.5
34.06701	34.98519	33.14883	44.01932	6439.57262	1.674581	130.72
34.2556	35.26771	33.24349	43.90109	6494.5638	1.831722	140.61
34.44196	35.54573	33.3382	43.79376	6548.33568	1.982761	151
34.61535	35.80352	33.42719	43.68945	6597.85024	2.119836	161
34.77809	36.04454	33.51164	43.5876	6643.87	2.245259	170.68
34.94257	36.28827	33.59686	43.48127	6689.93534	2.370745	181
35.09039	36.50467	33.67611	43.38248	6730.95164	2.477668	191
35.22966	36.70847	33.75084	43.28993	6769.26123	2.577283	200.5
35.43619	37.01009	33.86229	43.15754	6825.483	2.722258	216
35.61581	37.27115	33.96047	43.03954	6873.8018	2.844582	230.45
35.77862	37.50679	34.05045	42.93055	6917.14009	2.952539	245.6
35.8826	37.65676	34.10844	42.86017	6944.59031	3.020018	261
36.05065	37.898	34.20329	42.74552	6988.5816	3.126247	275.67
36.15924	38.05336	34.26511	42.67062	7016.76492	3.193419	291
36.24362	38.17394	34.3133	42.61262	7038.53238	3.245061	306
36.30726	38.26532	34.34919	42.57004	7054.87401	3.284585	320.45
36.35132	38.32829	34.37435	42.54045	7066.15007	3.311366	335.83
36.37485	38.3613	34.3884	42.52462	7072.15939	3.324618	351.25
36.38087	38.36952	34.39222	42.52057	7073.69494	3.327635	366
36.38289	38.37229	34.39349	42.51921	7074.21146	3.328661	380.5
36.38387	38.37362	34.39412	42.51855	7074.46062	3.329141	396
36.38425	38.37414	34.39435	42.51829	7074.5566	3.329345	411.5
36.3846	38.37464	34.39457	42.51805	7074.64801	3.329531	426
36.3846	38.37464	34.39457	42.51805	7074.64801	3.329531	440

Hull hole (gpm)	Bulkhd (gpm)	Comp_E level	Comp_E vol	Comp_F level	Comp_F vol	Time (min)
0	0	0.04	8.381344	0.04	4.257545	0
5938.5	0	0.04	8.381344	5.952793	930.00049	1.18
5973.95	0	0.04	8.381344	9.363991	2045.0754	2.58
6006.66	0	0.04	8.381344	11.838267	3220.0371	4.05
6028.71	0	0.04	8.381344	13.46424	4011.4595	5.05
6043.18	0	0.04	8.381344	14.761503	4818.7012	6
6071.77	0	0.04	8.381344	16.106792	5655.8291	7.05
6089.35	332.961	0.096723	20.266655	17.503262	6524.8022	8.15
6101.39	572.481	0.37679	78.950096	18.491045	7227.0596	9.08
6121.25	736.803	0.797702	167.14545	19.470299	7956.6724	10.08
6040.73	863.357	1.293026	270.93243	20.39197	8643.3818	11.05
5771.35	973.858	1.900344	398.18591	21.315947	9331.8105	12.08
5553.45	1062.31	2.540154	532.24768	22.135612	9942.5186	13.07
5354.28	1131.26	3.229253	676.63696	22.824028	10514.565	14.05
5134.5	1194.39	3.996542	837.40973	23.49226	11078.101	15.08
4965.49	1246.35	4.547115	992.48938	24.069464	11564.867	16.03
4762.22	1297.19	4.841869	1168.2708	24.657896	12061.104	17.07
4581.71	1342.24	5.142767	1347.7156	25.199093	12517.51	18.08
4430.48	1381.09	5.437928	1523.7391	25.6807	12923.659	19.05
4243.82	1418.24	5.757014	1714.0304	26.153889	13322.708	20.07
4080.73	1451.4	6.07873	1905.8905	26.587019	13687.977	21.07
3936.65	1479.72	6.407357	2101.8723	26.964785	14028.523	22.07
3806.48	1504.87	6.736341	2298.0669	27.306387	14341.775	23.05
3669.64	1528.75	7.082064	2504.2441	27.63619	14644.209	24.07
3543.87	1550.31	7.427204	2710.073	27.938255	14921.206	25.07
3440.47	1569.81	7.771107	2915.1646	28.215143	15175.112	26.05
3309	1588.02	8.125064	3126.2527	28.476871	15415.121	27.05
3193.36	1605.5	8.500915	3350.3962	28.73101	15648.169	28.1
3091	1620.74	8.862528	3566.0498	28.954676	15853.272	29.1
2988.64	1634.91	9.108737	3787.2937	29.16469	16045.858	30.12
2807.58	1658.97	9.571988	4220.3604	29.525429	16376.658	32.08
2666.51	1679.39	10.045447	4662.9702	29.835632	16661.117	34.07
2495.7	1696.48	10.532281	5118.083	30.098265	16901.955	36.08
2420.74	1710.3	11.007297	5562.1479	30.312529	17098.436	38.03
2306.22	1722.64	11.510493	6032.5581	30.505341	17275.246	40.08
2202.74	1732.42	12.000456	6490.5957	30.65906	17416.207	42.07
2136.96	1740.66	12.492967	6951.0156	30.789291	17535.633	44.05
2094.93	1747.79	12.987638	7413.4561	30.902449	17639.4	46.03
2045.91	1753.81	13.448449	7877.6406	30.998476	17727.457	48
2040.84	1759.54	13.847811	8366.8447	31.090115	17811.488	50.1
2018.58	1764.29	14.245166	8853.5898	31.166265	17884.031	52.17
1995.28	1768.3	14.611377	9302.1846	31.230694	17946.277	54.07
1958.02	1771.88	14.991254	9767.5215	31.288393	18002.021	56.03
1949.5	1775.24	15.378338	10241.686	31.342691	18054.482	58.03
1942.45	1778.48	15.772571	10724.606	31.395124	18105.139	60.07
1952.52	1781.73	16.17075	11212.362	31.447639	18155.877	62.12
1966.03	1785.38	16.624863	11768.637	31.507025	18213.25	64.45
1935.82	1787.98	16.982302	12206.488	31.549295	18254.09	66.28

Hull hole (gpm)	Bulkhd (gpm)	Comp_E level	Comp_E vol	Comp_F level	Comp_F vol	Time (min)
1961.38	1767.68	17.380075	12693.744	31.6012	18304.236	68.33
1956.27	1748.86	17.7318	13124.595	31.651731	18353.055	70.17
1922.17	1732.03	18.053907	13585.925	31.707197	18406.643	72.15
1917.1	1715.39	18.370691	14050.563	31.762886	18460.445	74.17
1901.1	1666.5	19.308052	15425.426	31.947708	18639.01	80.25
1807.88	1586.15	20.804836	17620.811	32.255039	18935.932	90.6
1722.83	1508.07	22.198187	19664.488	32.548901	19219.844	100.5
1636.6	1439.98	23.395611	21647.744	32.832703	19494.033	110.5
1558.5	1371.76	24.538771	23545.564	33.102924	19755.104	120.5
1485.74	1303.69	25.62475	25348.455	33.360104	20003.574	130.72
1407.73	1236.39	26.643833	27040.287	33.601128	20236.434	140.61
1334.52	1174.24	27.561861	28694.207	33.837219	20464.529	151
1264.19	1113.94	28.406099	30218.24	34.05352	20673.506	161
1200.96	1054.96	29.19025	31633.797	34.255493	20868.641	170.68
1146.57	990.571	29.980986	33061.246	34.446812	21053.479	181
1066.2	933.481	30.67326	34310.945	34.639198	21239.35	191
1000.83	877.001	31.312307	35484.02	34.812843	21407.111	200.5
902.427	790.226	32.220211	37210.773	35.062298	21648.119	216
803.465	707.781	32.999203	38692.355	35.279221	21857.695	230.45
716.123	625.187	33.696861	40019.246	35.475826	22047.645	245.6
645.75	566.871	34.138054	40858.363	35.600586	22169.285	261
525.512	459.361	34.842319	42197.813	35.802711	22369.531	275.67
426.27	375.155	35.29287	43054.727	35.933434	22499.033	291
318.454	294.362	35.639179	43717.422	36.033527	22598.199	306
237.733	212.055	35.89756	44221.332	36.102215	22666.246	320.45
145.382	130.648	36.074535	44566.48	36.152191	22715.76	335.83
48.3141	39.3801	36.165485	44743.863	36.185444	22748.703	351.25
14.5904	11.7151	36.187477	44786.754	36.1964	22759.557	366
6.39578	4.96113	36.194912	44801.258	36.200008	22763.131	380.5
3.13793	2.63407	36.198452	44808.156	36.201847	22764.953	396
2.26588	1.77247	36.199883	44810.945	36.202423	22765.523	411.5
1.48141	0.98916	36.20121	44813.539	36.203037	22766.129	426
1.48141	0.98916	36.20121	44813.539	36.203037	22766.129	440

APPENDIX L. SCENARIO 3A RESULTS

Entire scenario run at speed ratio of 3.

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Pumps on	Valves open	Time (min)
30.00392	30.00392	30.00392	45.44269	5144.16146	-7E-08	none	none	0
30.04185	30.02789	30.05581	45.46543	5156.79718	-0.03055	F/G	F gate	0.5
30.05848	30.0384	30.07855	45.47377	5162.33333	-0.04389	F/G	F gate	1.05
30.07039	30.04594	30.09485	45.47966	5166.30256	-0.05343	F/G	F gate	1.58
30.08084	30.05255	30.10913	45.48434	5169.78165	-0.06178	F/G	F gate	2.05
30.09242	30.05988	30.12497	45.48897	5173.63928	-0.07103	F/G	F gate	2.57
30.10216	30.06603	30.13828	45.49238	5176.88074	-0.0788	F/G	F gate	3
~~30.1149~~	30.0741	30.1557	45.49615	5181.12505	-0.08895	F/G	F gate	3.57
30.12579	30.08099	30.17059	45.49871	5184.7532	-0.09761	F/G	F gate	4.05
30.15066	30.09673	30.20458	45.50212	5193.03389	-0.11733	F/G	F gate	5.15
30.17107	30.10966	30.23248	45.50551	5199.83231	-0.13348	F/G	F gate	6.05
30.19421	30.12432	30.2641	45.5106	5207.53821	-0.15173	F/G	F gate	7.07
30.21666	30.13855	30.29477	45.51416	5215.01293	-0.16938	F/G	F gate	8.05
30.22738	30.14534	30.30942	45.51536	5218.58484	-0.1778	E/F/G	F gate	8.55
30.22878	30.14623	30.31133	45.51549	5219.04897	-0.17889	E/F/G	F gate	9.55
30.22877	30.14622	30.31132	45.51549	5219.04683	-0.17889	E/F/G	F gate	10.95
30.22876	30.14622	30.31131	45.51549	5219.04491	-0.17888	E/F/G	F gate	12.12

Hull hole (gpm)	Bulkhd (gpm)	Pipe_F1 (gpm)	Comp_E level	Comp_E vol	Comp_F level	Comp_F vol	Time (min)
0	0	0	0.04	8.381344	0.04	4.257545	0
5940.72	0	0	0.04	8.381344	4.194978	446.5076	0.5
5949.9	0	4000.5	0.04	8.381344	4.996408	640.2729	1.05
5951.23	0	4000.5	0.04	8.381344	5.45499	779.1958	1.58
5955.3	0	4000.53	0.04	8.381344	5.856944	900.9641	2.05
5956.21	0	4000.53	0.04	8.381344	6.302632	1035.981	2.57
5960.74	0	4000.56	0.04	8.381344	6.677131	1149.432	3
5963.91	0	4000.56	0.04	8.381344	7.167494	1297.983	3.57
5967.31	0	4000.56	0.04	8.381344	7.586668	1424.968	4.05
5974.94	0	4000.55	0.04	8.381344	8.543372	1714.793	5.15
5981.21	0	4000.37	0.04	8.381344	9.169541	1952.737	6.05
5988.52	0	4000.37	0.04	8.381344	9.737498	2222.444	7.07
5995.16	0	4000.36	0.04	8.381344	10.288417	2484.059	8.05
5999.19	0	4000.34	0.04	8.381344	10.551682	2609.076	8.55
5999.61	0	6000.09	0.04	8.381344	10.585891	2625.32	9.55
5999.61	0	6000.08	0.04	8.381344	10.585733	2625.245	10.95
5999.61	0	6000.08	0.04	8.381344	10.585591	2625.178	12.12

APPENDIX M. SCENARIO 3B RESULTS

Scenario 3B was run at 4 speed ratios.

Speed ratio	Time (min)
5	0
2	22.1
6	57.67
10	102.7

Speed ratio was slowed to monitor pump for low net positive suction head (npsh).

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Pumps on	Valves open	Time (min)
30.00392	30.00392	30.00392	45.44269	5144.16146	-7E-08	none	none	0
30.07935	30.05161	30.10709	45.4837	5169.28462	-0.06059	none	none	1.07
30.14657	30.09415	30.199	45.50181	5191.67419	-0.1141	none	none	2.05
30.2232	30.14269	30.3037	45.51493	5217.19136	-0.17452	none	none	3.17
30.28633	30.18273	30.38993	45.51596	5238.21119	-0.22384	none	none	4.08
30.3566	30.22733	30.48587	45.50647	5261.60134	-0.27827	none	none	5.1
30.42598	30.27142	30.58055	45.49818	5284.68792	-0.33152	none	none	6.1
30.49215	30.31351	30.67079	45.48107	5306.69346	-0.38184	none	none	7.05
30.56206	30.35898	30.76514	45.45397	5329.93256	-0.43249	none	none	8.05
30.63343	30.41048	30.85639	45.43234	5353.64156	-0.4731	none	none	9.07
30.71099	30.46929	30.95269	45.40778	5379.38538	-0.51089	none	none	10.17
30.84116	30.57315	31.10918	45.35511	5422.5395	-0.56284	none	none	12.05
30.96926	30.6818	31.25671	45.2979	5464.92828	-0.5999	E	E gate	14.05
31.05174	30.72232	31.38116	45.22659	5492.17542	-0.68447	E	E gate	16.12
31.11906	30.75506	31.48306	45.15922	5514.38584	-0.75361	E	E gate	18.05
31.17998	30.78549	31.57447	45.09275	5534.4581	-0.81409	E	E gate	20.03
31.23525	30.81374	31.65675	45.03161	5552.64652	-0.8673	E	E gate	22.1
31.25088	30.82351	31.67825	45.01747	5557.78879	-0.87867	none	none	22.7
31.29371	30.86943	31.71798	45.00447	5571.8646	-0.87063	E	E gate	23.7
31.31566	30.8822	31.74912	44.98237	5579.07498	-0.88847	E	E gate	24.7
31.33613	30.89306	31.7792	44.9598	5585.79488	-0.9072	E	E gate	25.7
31.35387	30.90254	31.80521	44.93991	5591.61605	-0.92326	E	E gate	26.7
31.37226	30.91243	31.8321	44.91898	5597.64748	-0.93975	E	E gate	27.7
31.38785	30.92086	31.85483	44.901	5602.75718	-0.95359	E	E gate	28.7
31.40426	30.92979	31.87873	44.88184	5608.13682	-0.96804	E	E gate	29.7
31.41533	30.93585	31.89481	44.86878	5611.76326	-0.97771	E	E gate	30.7
31.42794	30.94278	31.91309	44.85379	5615.89258	-0.98864	E	E gate	31.7
31.43903	30.9489	31.92915	44.8405	5619.52398	-0.99819	E	E gate	32.7
31.44909	30.95448	31.9437	44.82836	5622.81729	-1.00679	E	E gate	33.7
31.45819	30.95954	31.95684	44.8173	5625.79681	-1.01454	E	E gate	34.7
31.4664	30.96413	31.96867	44.80728	5628.48322	-1.02148	E	E gate	35.7
31.47367	30.9682	31.97914	44.79837	5630.8606	-1.02759	E	E gate	36.7
31.48154	30.97262	31.99046	44.78867	5633.43482	-1.03418	E	E gate	37.88
31.48585	30.97505	31.99665	44.78333	5634.84597	-1.03778	E (tripped)	E gate	38.65
31.49345	30.98016	32.00675	44.77524	5637.33136	-1.04245	E (tripped)	E gate	39.65

Mean Draft	Fwd Draft	Aft Draft	GM(T)	Displacement	LCG (ft)	Pumps on	Valves open	Time (min)
31.49779	30.98342	32.01215	44.77118	5638.74756	-1.0444	none	none	40.7
31.51447	31.00862	32.02031	44.77574	5644.19988	-1.02644	E	E gate	41.45
31.52035	31.01315	32.02755	44.7703	5646.12263	-1.0289	E	E gate	42.7
31.52379	31.01512	32.03246	44.76603	5647.24653	-1.0317	E	E gate	43.7
31.52719	31.01707	32.03731	44.76182	5648.35572	-1.03446	E	E gate	44.83
31.52935	31.01831	32.04039	44.75913	5649.06372	-1.03621	E	E gate	45.7
31.53184	31.01975	32.04394	44.75604	5649.87673	-1.03822	E	E gate	46.75
31.5336	31.02076	32.04643	44.75386	5650.44906	-1.03963	E	E gate	47.62
31.53546	31.02184	32.04909	44.75154	5651.05973	-1.04112	E	E gate	48.7
31.5373	31.02291	32.0517	44.74925	5651.66042	-1.04259	E	E gate	49.7
31.5384	31.02354	32.05325	44.7479	5652.01712	-1.04346	E	E gate	50.7
31.53962	31.02425	32.05498	44.74639	5652.41525	-1.04443	E	E gate	51.7
31.54064	31.02485	32.05643	44.74512	5652.7504	-1.04524	E	E gate	52.7
31.54148	31.02534	32.05762	44.74408	5653.02443	-1.04589	E	E gate	53.65
31.54228	31.02581	32.05875	44.74309	5653.28529	-1.04652	E	E gate	54.7
31.54297	31.02622	32.05972	44.74224	5653.51196	-1.04706	E	E gate	55.7
31.5437	31.02666	32.06075	44.74134	5653.75023	-1.04762	E	E gate	56.95
31.54408	31.02688	32.06127	44.74088	5653.87193	-1.04791	E	E gate	57.67
31.54494	31.02739	32.06248	44.73984	5654.15261	-1.04856	E	E gate	59.75
31.54565	31.02783	32.06346	44.73898	5654.38456	-1.04908	E	E gate	62.05
31.54593	31.028	32.06386	44.73864	5654.47742	-1.04928	E	E gate	63.15
31.54627	31.02822	32.06433	44.73824	5654.58932	-1.04952	E	E gate	64.9
31.54654	31.02839	32.06468	44.73794	5654.67487	-1.0497	E	E gate	67.5
31.54791	31.03035	32.06546	44.73811	5655.1223	-1.04844	E	E gate	69.42
31.5481	31.03046	32.06573	44.73786	5655.18455	-1.0486	E	E gate	71.77
31.54822	31.03053	32.06592	44.73769	5655.22629	-1.04871	E	E gate	74.05
31.54831	31.03058	32.06605	44.73757	5655.25565	-1.04879	E	E gate	76.27
31.54838	31.03061	32.06614	44.73749	5655.27583	-1.04885	E	E gate	78.42
31.54842	31.03063	32.06621	44.73742	5655.29108	-1.04889	E	E gate	80.67
31.54846	31.03065	32.06627	44.73737	5655.30189	-1.04893	E	E gate	82.94
31.54849	31.03066	32.06633	44.73731	5655.31444	-1.04898	E	E gate	88.29
31.54851	31.03066	32.06636	44.73728	5655.31998	-1.04901	E	E gate	93.32
31.5485	31.03065	32.06636	44.73727	5655.31763	-1.04902	E	E gate	98.5
31.5485	31.03063	32.06636	44.73726	5655.31471	-1.04904	E	E gate	102.7
31.54826	31.03023	32.06629	44.73713	5655.23783	-1.04939	E	E gate	293.6

Hull hole (gpm)	Bulkhd (gpm)	Pipe_E1 (gpm)	Comp_E level	Comp_E vol	Comp_F level	Comp_F vol	Time (min)
0	0	0	0.04	8.381344	0.04	4.257545	0
5950.72	0	0	0.04	8.381344	5.79952	883.5679	1.07
5972.09	0	0	0.04	8.381344	8.38628	1667.203	2.05
5993.45	0	0	0.04	8.381344	10.448977	2560.304	3.17
6013.78	0	0	0.04	8.381344	11.998228	3295.998	4.08
6033.77	0	0	0.04	8.381344	13.630075	4114.653	5.1
6054.79	0	0	0.04	8.381344	14.928606	4922.684	6.1
6074.78	0	0	0.04	8.381344	16.166332	5692.877	7.05
6096.5	317.35	0	0.088992	18.64673	17.456944	6495.98	8.05
6117.43	581.385	0	0.39392	82.53943	18.537809	7261.903	9.07
6140.03	757.909	0	0.86777	181.8271	19.613878	8063.649	10.17
5782.72	977.164	0	1.919437	402.1866	21.345304	9353.684	12.05
5341.7	1135.68	0	3.275965	686.4247	22.869667	10553.05	14.05
4930.98	1254.13	1735.94	2.642357	553.6625	24.157919	11639.46	16.12
4565.69	1343.38	1735.96	2.105476	441.1679	25.213102	12529.32	18.05
4213.49	1418.5	1735.97	1.658257	347.4606	26.15727	13325.56	20.03
3882.03	1480.71	1735.98	1.2832	268.8736	26.978111	14040.74	22.1
3797.82	1495.46	1727.05	1.267425	265.5681	27.177982	14224.03	22.7
3664.28	1519.07	0	2.200985	461.1803	27.501905	14521.07	23.7
3536.79	1540.01	1735.95	2.12949	446.1998	27.793446	14788.41	24.7
3401.81	1560.14	1735.99	2.009125	420.9792	28.077431	15048.83	25.7
3283.63	1577.32	1735.97	1.907928	399.7749	28.322731	15273.77	26.7
3156.17	1594.87	1735.96	1.806123	378.4434	28.5762	15506.21	27.7
3042.97	1609.56	1736	1.722355	360.8912	28.790363	15702.6	28.7
2919.45	1624.84	1736	1.636647	342.9326	29.015278	15908.84	29.7
2833.74	1635.04	1736.01	1.580355	331.1375	29.166552	16047.56	30.7
2733.19	1646.55	1736.01	1.517718	318.013	29.33847	16205.21	31.7
2642.31	1656.58	1736.01	1.46396	306.7488	29.489355	16343.58	32.7
2557.81	1665.62	1736	1.416273	296.7568	29.62595	16468.84	33.7
2477.36	1673.73	1736.01	1.374047	287.9091	29.749319	16581.97	34.7
2403.72	1681.01	1736.01	1.336721	280.088	29.860382	16683.81	35.7
2336.34	1687.41	1736.01	1.304297	273.2941	29.958527	16773.81	36.7
2261.21	1694.31	1736.01	1.269828	266.0716	30.064655	16871.13	37.88
2220.08	1698.07	1698.07	1.251229	262.1746	30.122766	16924.42	38.65
2151.26	1704.06	1736.02	1.26059	264.1359	30.215488	17009.45	39.65
2115.24	1707.19	1734.98	1.284037	269.0488	30.264185	17054.1	40.7
2091.31	1709.78	0	2.018625	422.9699	30.304434	17091.01	41.45
2044.39	1713.96	1736.02	2.055068	430.6057	30.369493	17150.67	42.7
2007.69	1716.9	1736.02	2.041751	427.8154	30.41543	17192.8	43.7
1970.67	1719.8	1736.02	2.028829	425.1078	30.46072	17234.33	44.83
1947.41	1721.64	1736.01	2.020713	423.4072	30.489597	17260.81	45.7
1919.01	1723.75	1736.02	2.011533	421.4839	30.522726	17291.19	46.75
1899.76	1725.24	1736.02	2.005177	420.1519	30.546022	17312.55	47.62
1878.51	1726.82	1736.02	1.998504	418.7538	30.570854	17335.32	48.7
1856.79	1728.37	1736.02	1.992077	417.4071	30.595253	17357.7	49.7
1844.45	1729.29	1736.02	1.98834	416.624	30.609716	17370.96	50.7
1830.18	1730.31	1736.02	1.984252	415.7675	30.625849	17385.75	51.7

Hull hole (gpm)	Bulkhd (gpm)	Pipe_E1 (gpm)	Comp_E level	Comp_E vol	Comp_F level	Comp_F vol	Time (min)
1817.95	1731.17	1736.02	1.980895	415.0641	30.639406	17398.19	52.7
1808.04	1731.87	1736.02	1.978226	414.5048	30.650476	17408.34	53.65
1798.65	1732.54	1736.02	1.975761	413.9884	30.660995	17417.98	54.7
1790.53	1733.12	1736.02	1.9737	413.5565	30.67012	17426.35	55.7
1781.84	1733.73	1736.02	1.971639	413.1247	30.679682	17435.12	56.95
1777.32	1734.04	1736.02	1.970641	412.9154	30.684555	17439.59	57.67
1767.1	1734.74	1736.02	1.968532	412.4737	30.695751	17449.86	59.75
1758.65	1735.33	1736.02	1.967121	412.1779	30.704927	17458.27	62.05
1755.36	1735.56	1736.02	1.966691	412.0879	30.70857	17461.61	63.15
1751.03	1735.83	1736.02	1.966339	412.0142	30.712921	17465.6	64.9
1748.29	1736.04	1736.02	1.966256	411.9966	30.716204	17468.61	67.5
1745.14	1736.32	1737.02	2.021297	423.5298	30.720707	17472.74	69.42
1742.73	1736.49	1737.02	2.02037	423.3354	30.723293	17475.11	71.77
1741.1	1736.6	1736.6	2.019681	423.1911	30.725042	17476.72	74.05
1739.94	1736.68	1737.02	2.019142	423.0781	30.726288	17477.86	76.27
1739.13	1736.73	1737.02	2.018709	422.9873	30.727156	17478.65	78.42
1738.49	1736.77	1737.02	2.018329	422.9078	30.727825	17479.27	80.67
1738.04	1736.81	1737.02	2.017992	422.8371	30.728315	17479.72	82.94
1737.44	1736.84	1737.02	2.017328	422.698	30.728945	17480.29	88.29
1737.14	1736.87	1737.02	2.016856	422.5992	30.729263	17480.59	93.32
1737.1	1736.87	1737.02	2.016361	422.4954	30.729288	17480.61	98.5
1737.1	1736.87	1737.02	2.015872	422.3929	30.729288	17480.61	102.7
1736.87	1736.87	1737.02	2.003031	419.7022	30.729288	17480.61	293.6

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